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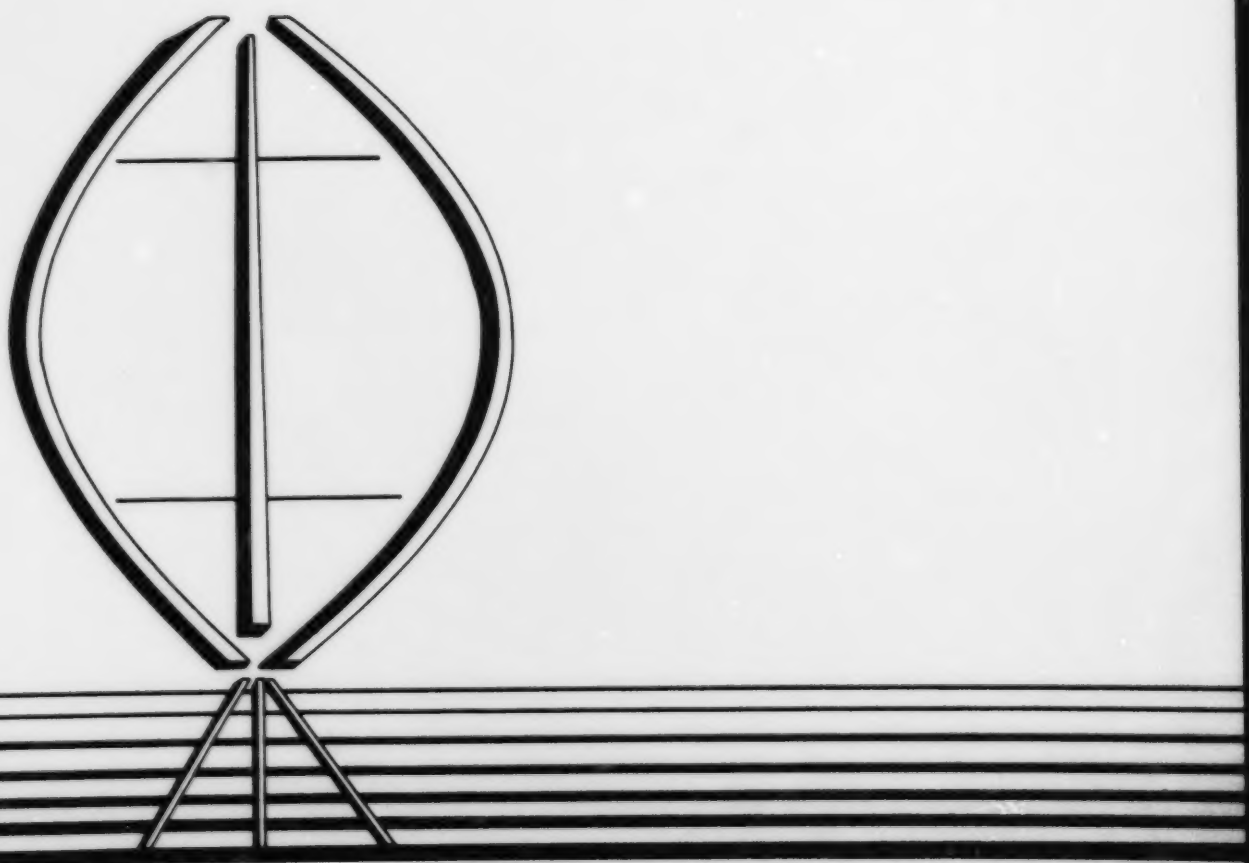
Technical Memorandum

Background Noise Measurements at Project Eole Site During July 1984

G. Krishnappa and J.A. Hammer

May 1985



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G. Krishnappa, J.A. Hammer

TM-WE-025
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SUMMARY

This report presents the results of background noise measurements carried out around the Project ÉOLE Site in the summer of 1984 to assess the environmental impact of the operation of the wind turbine. The results indicate that the noise radiated from the machine is not likely to affect the background levels in and around the main residen tial area of Cap Chat village due to existing high background noise levels from the traffic on Highway 132. The existing noise levels are low around the scattered houses south of the ÉOLE site and are not expected to increase since these homes are at large distances from the turbine site. The results show that the background noise in the residential area close to the highway is predominantly due to traffic. In the open area south of the ÉOLE site, wind is the major source of noise and the noise levels increase with wind speeds. The presence of trees increases the levels by 2 to 10 dB.

RÉSUMÉ

Le présent rapport donne les résultats des mesures du bruit de fond effectuées aux alentours des installations du projet ÉOLE au cours de l'été 1984 en vue d'évaluer les effets environnementaux de l'exploitation de la turbine éolienne. Les résultats indiquent que le bruit produit par la turbine ne risque pas d'influer sur les niveaux de bruit de fond à l'intérieur ou aux environs de la principale zone résidentielle du village de Cap-Chat, étant donné que les niveaux de bruit de fond dus à la circulation sur la route 132 sont déjà élevés. Les niveaux de bruit de fond existants sont faibles aux alentours des maisons dispersées au sud des installations du projet ÉOLE, et on ne prévoit pas qu'ils vont augmenter étant donné que ces maisons sont à de grandes distances de la turbine. Les résultats montrent que le bruit de fond à l'intérieur de la zone résidentielle à proximité de la route est dû principalement à la circulation. Dans la zone dégagée au sud de l'emplacement de la turbine, la principale source de bruit est le vent, et les niveaux de bruit augmentent avec la vitesse du vent. La présence d'arbres fait augmenter les niveaux de 2 à 10 dB.

BACKGROUND NOISE MEASUREMENTS AT PROJECT EOLE SITE DURING JULY 1984

G. Krishnappa and J.A. Hammer

1.0 INTRODUCTION

"Project ÉOLE" is a joint undertaking of the National Research Council of Canada and Hydro Quebec whose object is the design, construction, and assessment of a Darrieus-type megawatt-scale vertical axis wind turbine. The site chosen for the turbine is near the village of Cap Chat on the south shore of the St. Lawrence river on the Gaspé peninsula. The site was selected based on several criteria relating to integration of wind power to Hydro Quebec grid, meteorological data, and environmental impact of the turbine. Nearest residential areas around the turbine site are situated along Highway 132 and therefore are continuously exposed to traffic noise. Since the background noise in these areas is high, the operation of the wind turbine is not expected to drastically increase the noise levels over and above the current levels. The predicted noise levels with the turbine operating at its maximum capacity vary from 40 to 47 dBA at a distance of 100 m from the turbine. These levels are below the existing levels in some residential areas.

However, there are stringent provincial regulations coming into force limiting the noise levels that could be generated by installation of any new equipment or machinery in rural areas. Accurate predictions of noise radiated by the turbine at large distances are rather difficult to make as very little measured data exist on VAWT machines. These difficulties are compounded by variations in sound propagating conditions in the atmosphere such as windspeed, temperature, humidity, etc., as well as changes in terrain and vegetation. All these factors significantly affect local sound levels.

Measurement and documentation of background noise levels in the surrounding area prior to the installation of any machinery is necessary to assess the change produced in noise levels after its installation. Some of the reported results on horizontal axis machines indicate that at high wind speeds the noise from the machines is likely to be masked by the background noise generated by the wind itself.

Background noise levels are different for summer and winter due to changes in weather, vegetation, human and animal activities. In addition to the traffic noise, summer noise levels are influenced by birds and insects, farming activity, trees and vegetation, wind speed, and tourism in the area. Due to the absence of many activities, background noise levels

during winter are generally lower than summer time levels. Therefore, it was proposed that background noise level measurements be carried out during winter as well as summer seasons. This report describes the method and results of background noise measurements carried out around the ÉOLE site during July 1984.

2.0 ÉOLE SITE AND SURROUNDINGS

The turbine site and its surroundings are shown in Figure 1. The site is situated at an elevation of 120 m, with the ground on the north side sloping downwards towards Highway 132 and the shoreline of the St. Lawrence river. On the southern side, the site is surrounded by a mixed forest of deciduous and coniferous trees, in some areas only bushes. There are also some farm lands which are mainly used for harvesting hay.

Cap Chat has a population of about 3500 people and has clusters of houses situated along the sourthern side of Highway 132 running parallel to the St. Lawrence river shoreline. Nearest residences are about 0.75 km from the turbine site. Residential areas close to the highway are continuously exposed to the traffic noise and therefore the background noise levels are high. The noise generated by the wind turbine is not expected to exceed the existing background noise levels in these areas. The traffic is very light (only the occasional vehicle) along the road

Fig. 1. Location of the Éole wind turbine site on the Gaspé peninsula

running parallel to Highway 132, south of the site, joining Highway 132 and going into the village of Cap Chat. The background noise levels near the houses situated along this road are likely to be low and they are expected to be exposed to the turbine noise.

3.0 DESCRIPTION OF MEASUREMENT AREAS

The measurement points that were selected cover a wide range of terrain and vegetation conditions surrounding the site. However, the number of measurement points was biased towards residential areas, as one of the important objectives of the measurements was to document the background noise levels prior to the installation of the turbine. Due to the topography of the region it was not possible to locate the measurement points at equal distances over a grid surrounding the turbine site. The locations selected covered an area up to 4 km from the centre of the site. This area included open fields, tree lines, bushes, different traffic conditions, farming areas, a residential neighborhood, residences along the highway, and areas near the St. Lawrence River. Another objective of the measurements was to correlate the background noise levels with wind speeds under different vegetation conditions.

Following are the brief descriptions of the measurement sites which are marked on the map shown in Figure 2.

Site 1 — 2.4 km from ÉOLE, in a forest of deciduous and coniferous trees about 10 m high, 0.75 km from a farm.

Site 2 — 1.3 km from ÉOLE, long grass and small bushes, 30 m from a paved road, 30 m from deciduous trees, 0.75 km from a farm.

Site 3 — 1 km from ÉOLE, in a field of long grass on top of a hill, in direct sight of the turbine site.

Site 4 — 0.8 km from ÉOLE, July 14 - 5 m from deciduous trees, July 20 - 30 m from trees, long grass, on a hill across from ÉOLE.

Site 5 — 2 km from ÉOLE, 100 m from a farm, 50 m from deciduous trees, in a hayfield, farmer occasionally using tractors and equipment in fields.

Site 6 — 4.3 km from ÉOLE, 25 m from trees, 10 m from a dirt road used occasionally by cars and motorcycles, long grass, residential area.

Fig. 2. Locations of noise measurement sites in the vicinity of Éole

Site 7 3 km from ÉOLE, Cap Chat neighborhood, an active residential area, children playing, cars coming and going, and sometimes music outside.

Site 8 3 km from ÉOLE, 25 m from Highway 132 behind a home built beside the highway.

Site 9 1.7 km from ÉOLE, 85 m from Highway 132, July 16 - near small poplar trees, July 17 - beside a fence, animals in a pen nearby.

Site 10 1.3 km from ÉOLE, 0.3 km from Highway 132, meter mounted 10 m up a coniferous tree; 10 m from deciduous trees, 120 m from tourist parking lot, 250 m from the sea; 50 m above sea-level.

Site 11 1.2 km from ÉOLE, 24 m from Highway 132, coniferous trees up to 3 m high.

Site 12 0.9 km from ÉOLE, 84 m from Highway 132, July 16 - 1 m from deciduous trees, July 17 - beside coniferous trees, behind a vacant motel.

Site 13 0.9 km from ÉOLE, 40 m from Highway 132, behind deciduous bushes, 200 m from the seashore.

Site 14 2.3 km from ÉOLE, 65 m from Highway 132, behind a farm shed, farmer used tractors and machines, 200 m from the sea.

Site 15 Centre of the ÉOLE site, 30 m from decidous and coniferous trees, trees, men working occasionally.

Site 16 0.65 km from ÉOLE, 0.75 km from Highway 132, 25 m from a mixed forest, beside a farm pasture with cows in it.

Site 17 0.8 km from ÉOLE, 0.75 km from Highway 132, in a field of long grass.

Site 18 2.1 km from ÉOLE, 200 m from Highway 132, long grass, homes on Highway 132.

Site 19 1.2 km from ÉOLE, 0.6 km from Highway 132, beside a fence in a field of long grass.

Site 20 300 m from ÉOLE, in a group of small coniferous trees.

Site 21 0.5 km from ÉOLE, 0.6 km from Highway 132, in coniferous trees on the west side of the road running north to the cottage.

4.0 INSTRUMENTATION

Continuous 24-h sound level measurements are useful in helping to understand and describe the acoustic environment of a large site in both spatial and temporal terms.

Therefore, the instruments selected for this noise survey needed to be capable of sensing and automatically recording noise levels under varying conditions for a duration of 24 h. They also had to be capable of operating on battery power due to the remote nature of the measurement sites.

Time varying sound levels are usually represented by "equivalent sound level" denoted by L_{eq}. It is the value of the constant sound level which would result in exposure to the same A-weighted sound energy as would

the specified time varying signal, if the constant sound level persisted over an equal time interval. It is measured in dBA. The equivalent continuous noise level L_{eq} has become the basic measurement for describing community noise.

Noise levels were measured by using B&K Integrating Sound Level Meters, type 2225, and stored in B&K Data Storers, type C101. Integrating Sound Level Meters are capable of measuring A-weighted sound pressure levels continuously and calculating L_{eq} levels every 1 min. Noise levels from 25 to 140 dBA in four ranges can be measured by using this instrument. microphones of 12.7 mm diameter used with this instrument were fitted with wind screens to suppress the static pressure fluctuations caused by the wind. Measured 1 min L_{eq} levels were transferred to the attached Data Storer, which is capable of storing up to 25 h of data. Using a B&K Data Processor type C102, the stored data from the Data Storer was processed. This unit is capable of calculating L_{eq} levels from 1 min to 25 h. Using a B&K type 2312 Printer, the results from the Processor were printed out. All four instruments used in the measurements were capable of operating by battery power.

The Integrating Sound Lever Meter attached to the Data Storer was placed at the selected measurement point at a height of 1.2 m from the ground. At a given time, five units were in operation at five different locations. The instruments were calibrated each day using a sound level calibrator, B&K type 4230, before placement of the units to record data. After a 24-h period the recorded data was unloaded to the Processor for calculating 1-h, 8-h and 24-h L_{eq} levels.

At most points, a B&K Statistical Analyzer (type 4426) was used over short durations to obtain percentile levels, L_N , which represent the noise levels in dBA that were exceeded N percent of the measurement time.

The velocity and direction of the wind was measured by a wind anemometer mounted on a 10-m pole.

5.0 RESULTS

5.1 Background Noise Levels

Figures 3 to 40 show the measured 1-h L_{eq} levels at 19 measurement points for approximately 24-h periods. Due to some unavoidable instrumentation problems in rainy weather, some of the records are of shorter durations. Also shown at the bottom of each figure are the computed 8-h L_{eq} levels both during the day as well as the nighttime.

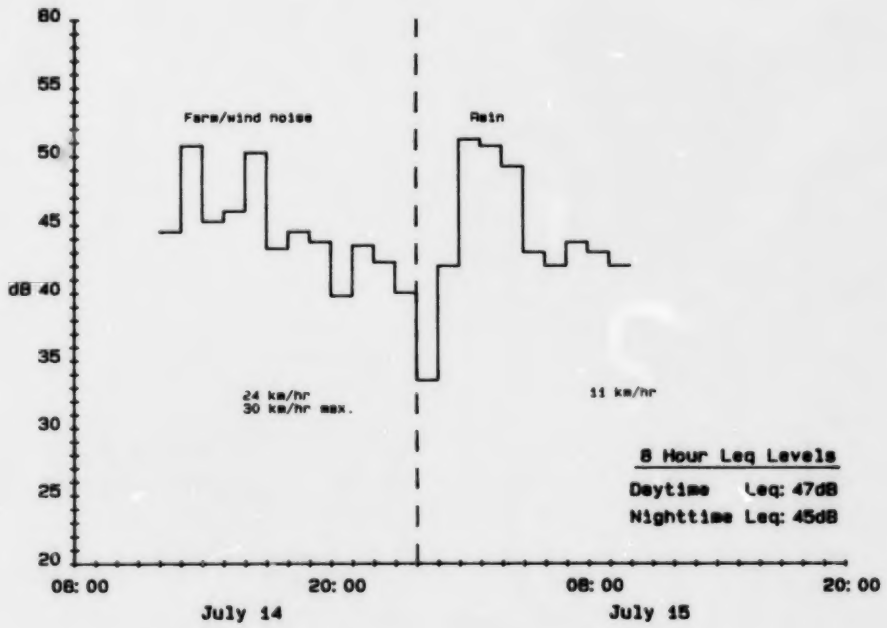

Fig. 3. One hour L_{eq} levels for site number 1, July 14-15

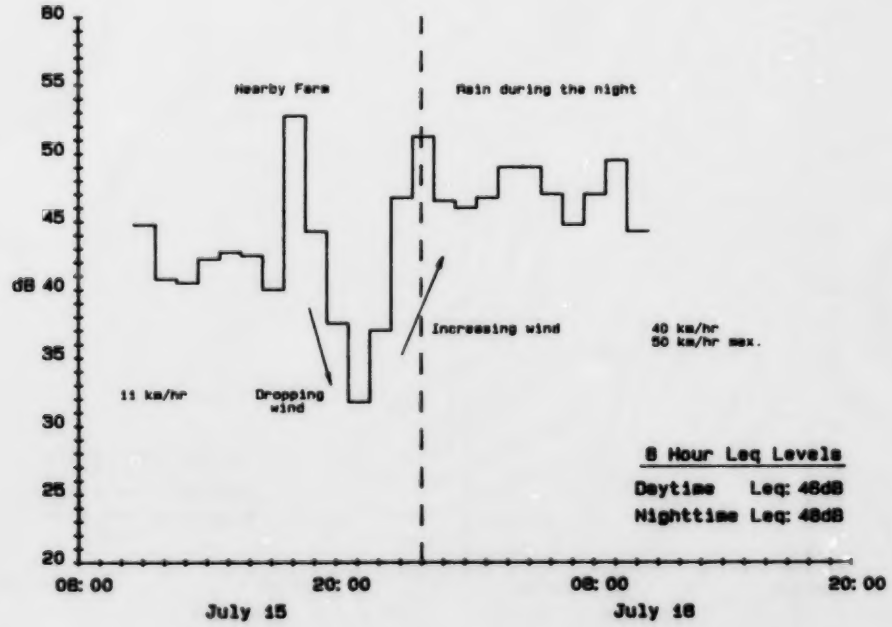

Fig. 4. One hour L_{eq} levels for site number 1, July 15-16

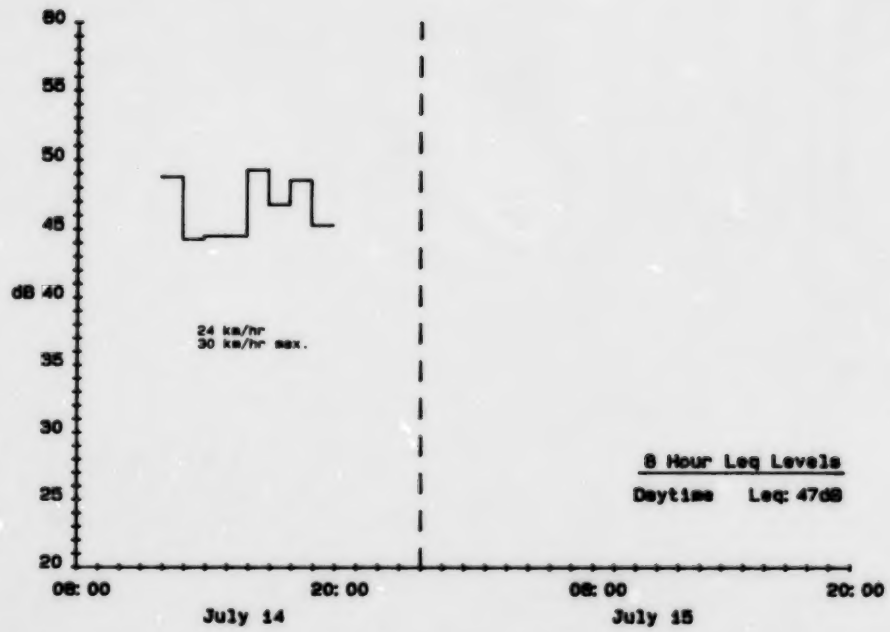

Fig. 5. One hour L_{eq} levels for site number 2, July 14-15

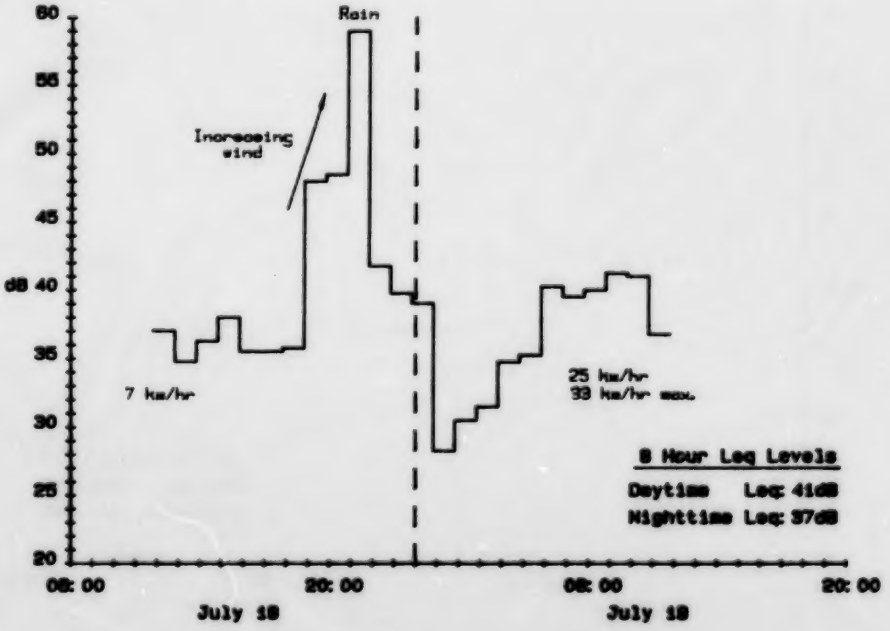

Fig. 6. One hour L_{eq} levels for site number 2, July 18-19

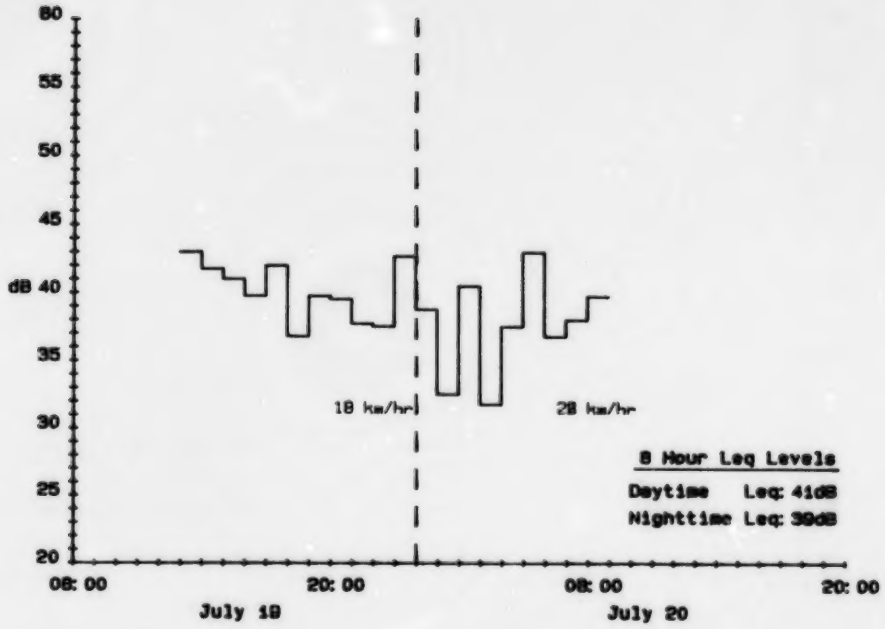

Fig. 7. One hour L_{eq} levels for site number 2, July 19-20

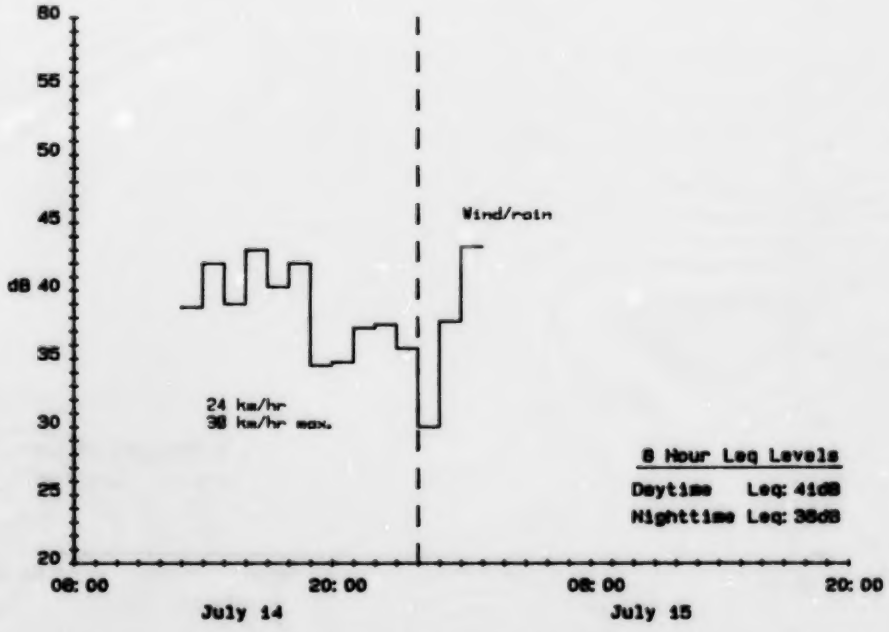

Fig. 8. One hour L_{eq} levels for site number 3, July 14-15

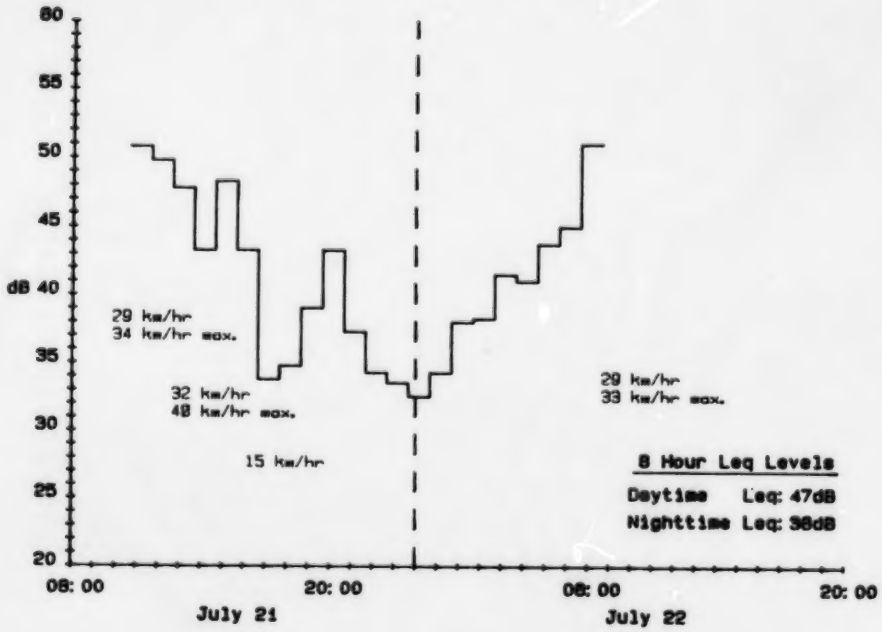

Fig. 9. One hour L_{eq} levels for site number 3, July 21-22

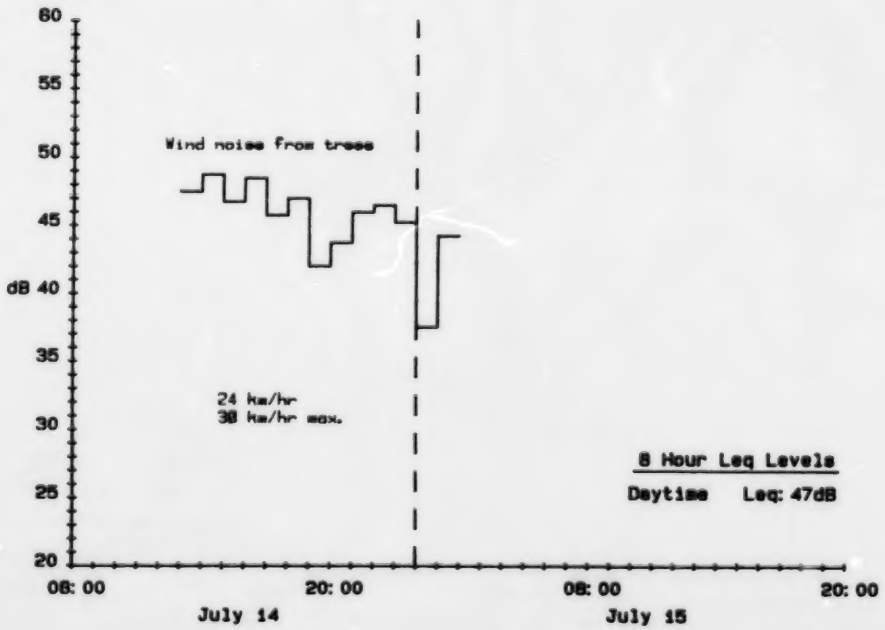

Fig. 10. One hour L_{eq} levels for site number 4, July 14-15

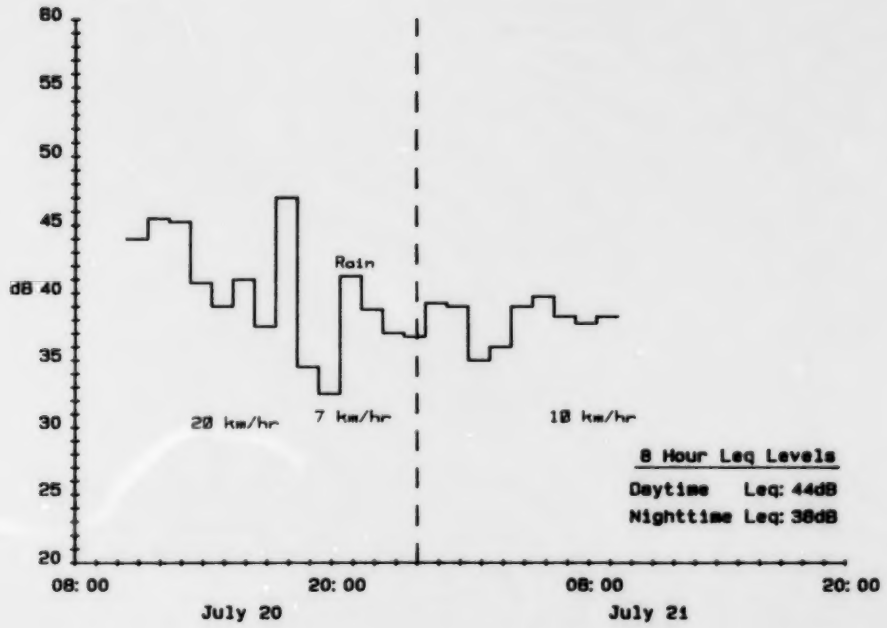

Fig. 11. One hour L_{eq} levels for site number 4, July 20-21

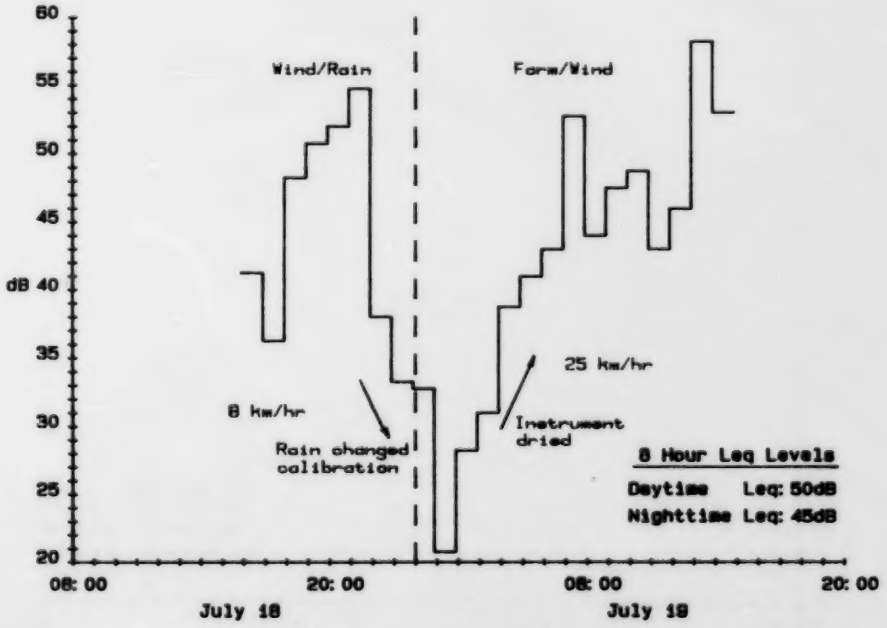

Fig. 12. One hour L_{eq} levels for site number 5, July 18-19

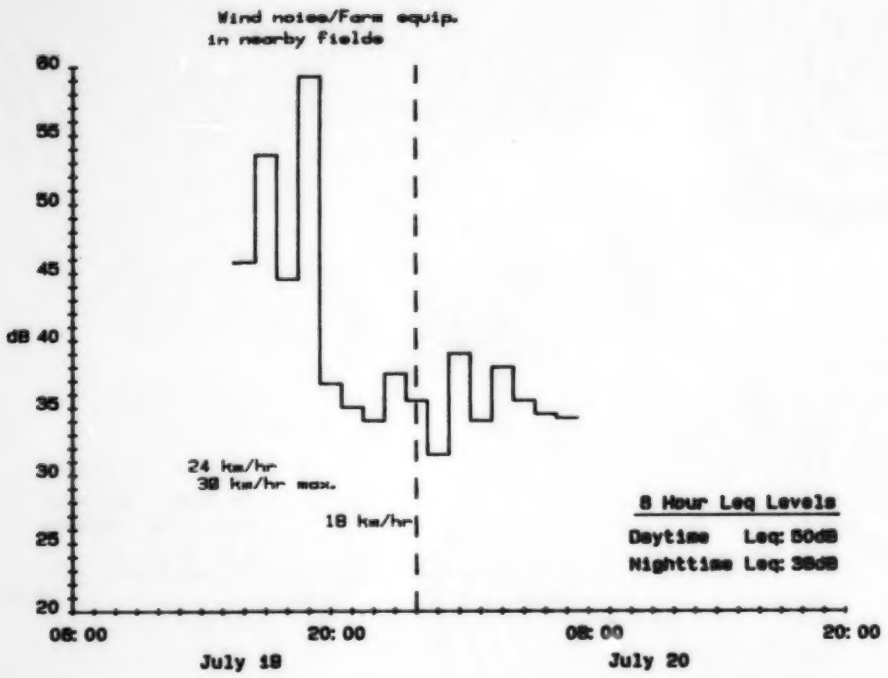

Fig. 13. One hour L_{eq} levels for site number 5, July 19-20

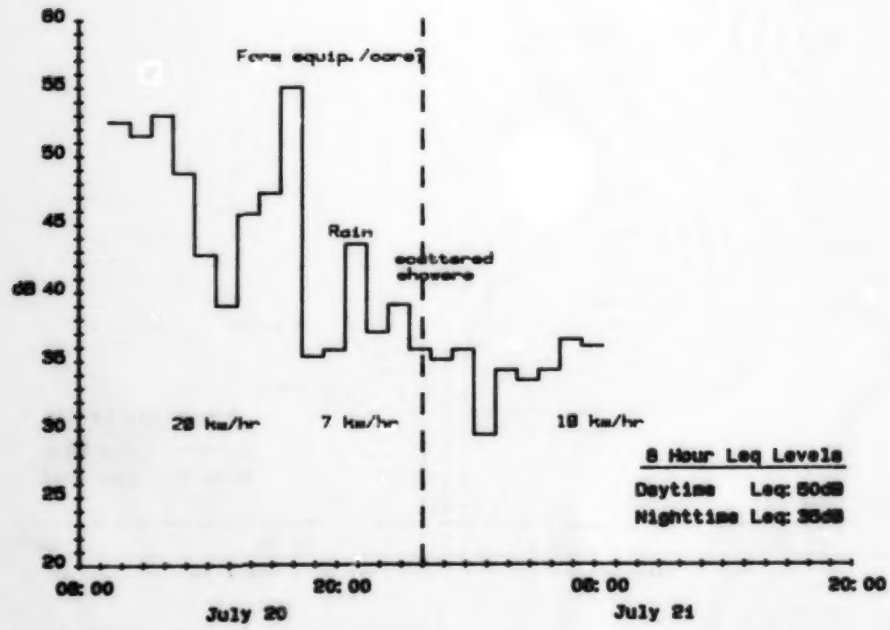

Fig. 14. One hour L_{eq} levels for site number 5, July 20-21

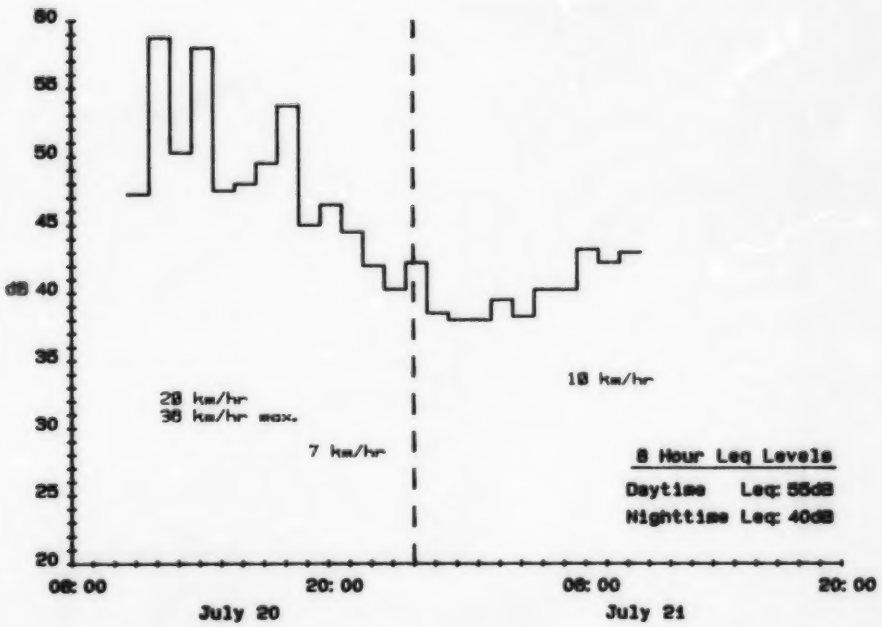

Fig. 15. One hour L_{eq} levels for site number 6, July 20-21

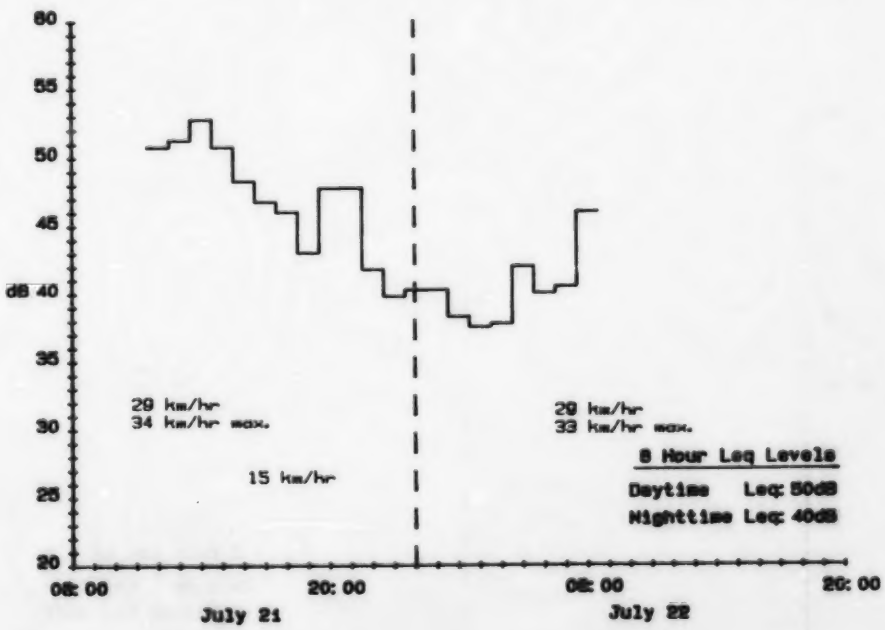

Fig. 16. One hour L_{eq} levels for site number 6, July 21-22

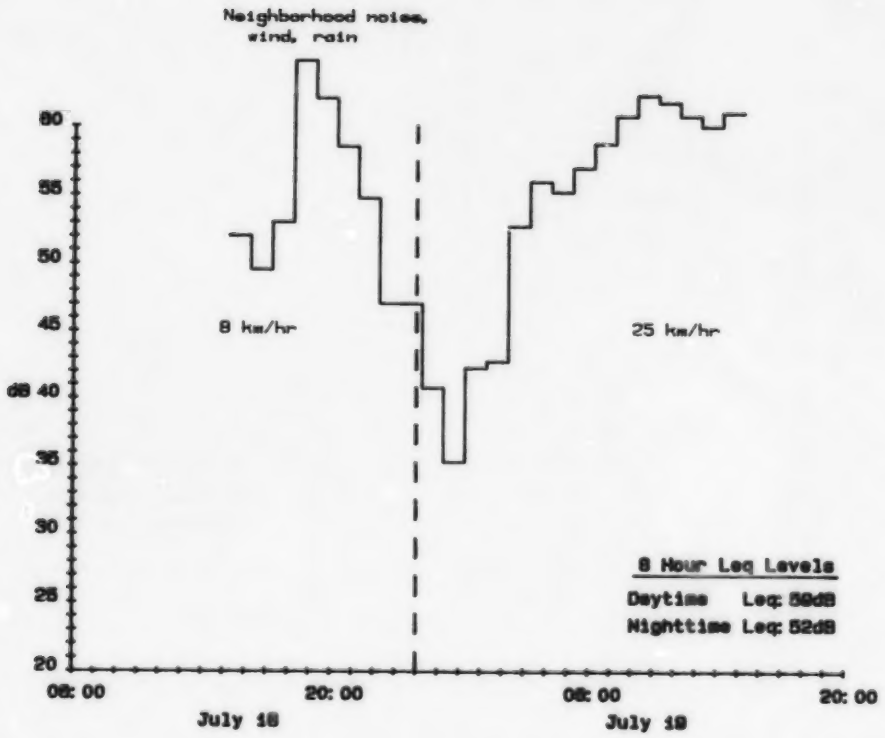

Fig. 17. One hour L_{eq} levels for site number 7, July 18-19

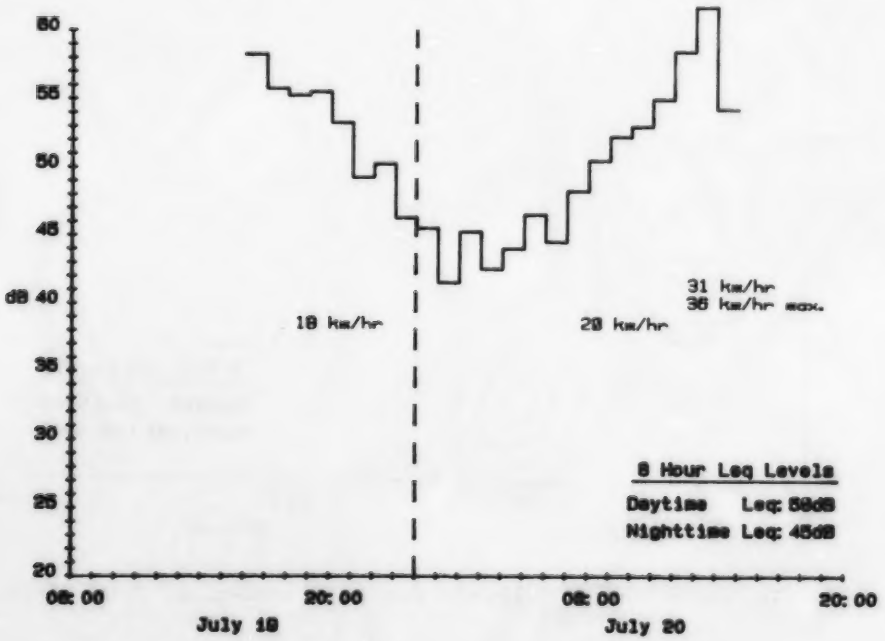

Fig. 18. One hour L_{eq} levels for site number 7, July 19-20

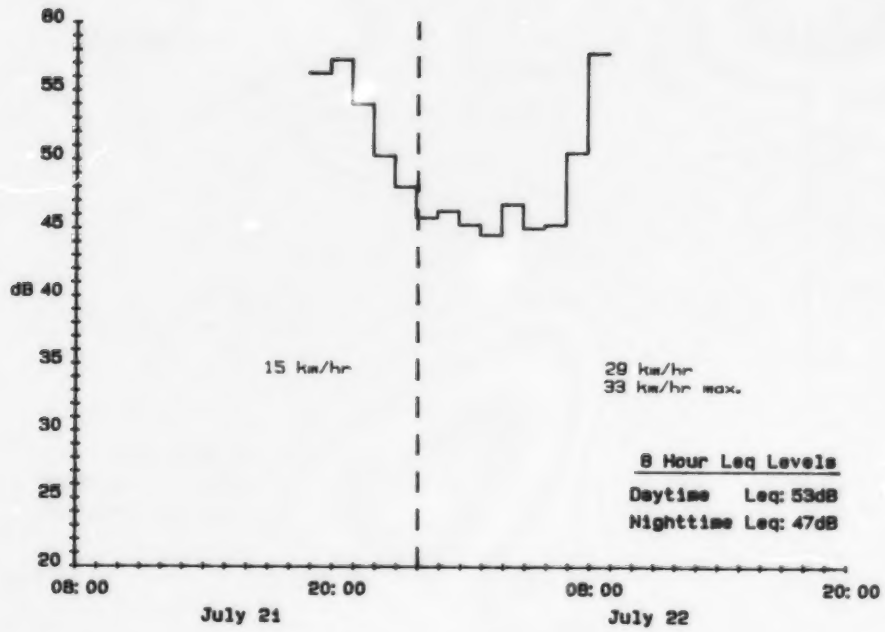

Fig. 19. One hour L_{eq} levels for site number 7, July 21-22

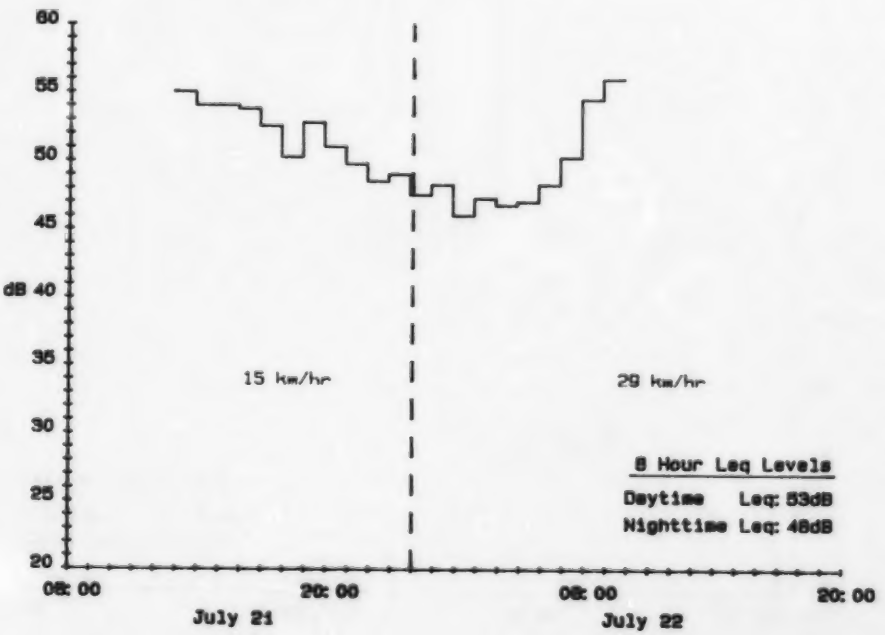

Fig. 20. One hour L_{eq} levels for site number 8, July 21-22

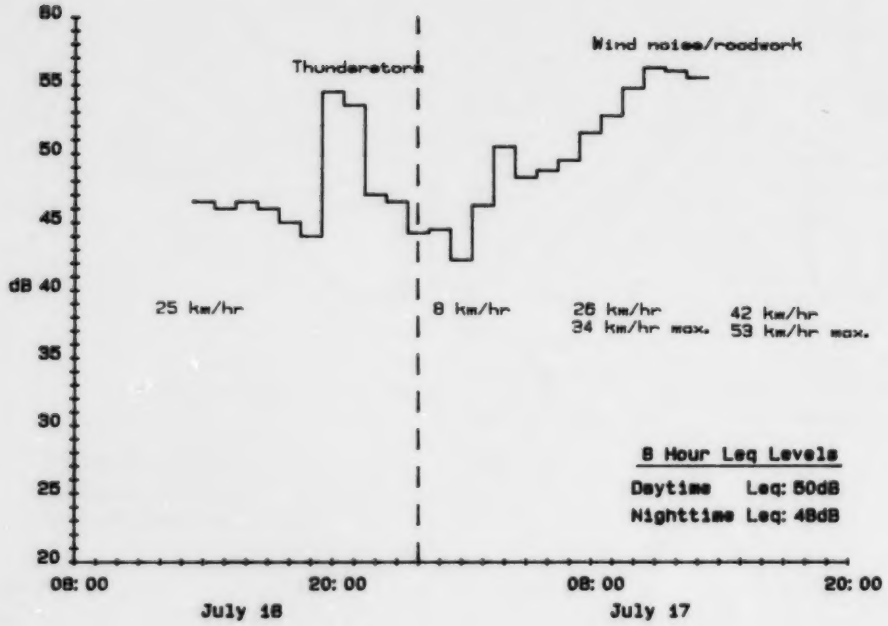

Fig. 21. One hour L_{eq} levels for site number 9, July 17-18

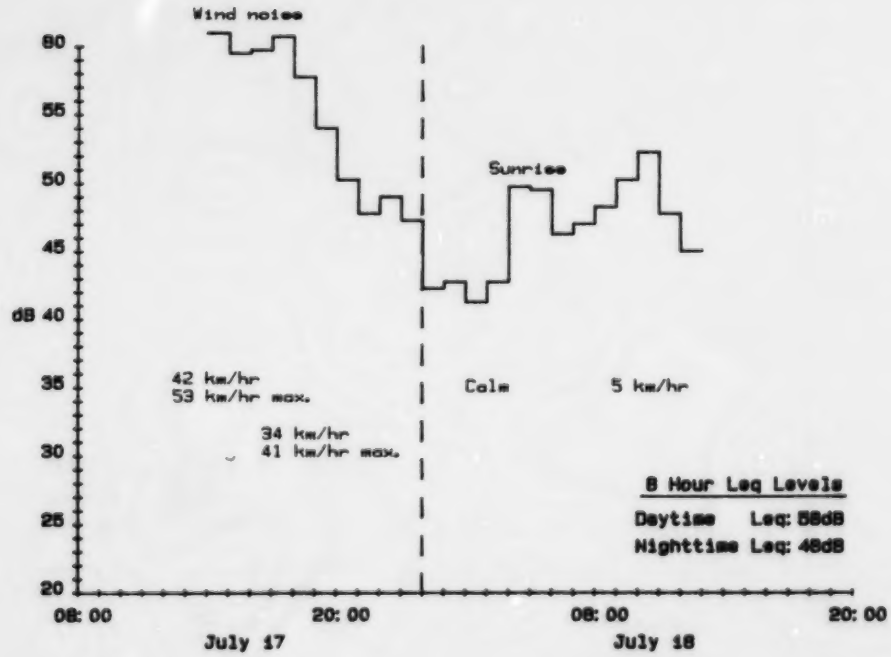

Fig. 22. One hour L_{eq} levels for site number 10, July 17-18

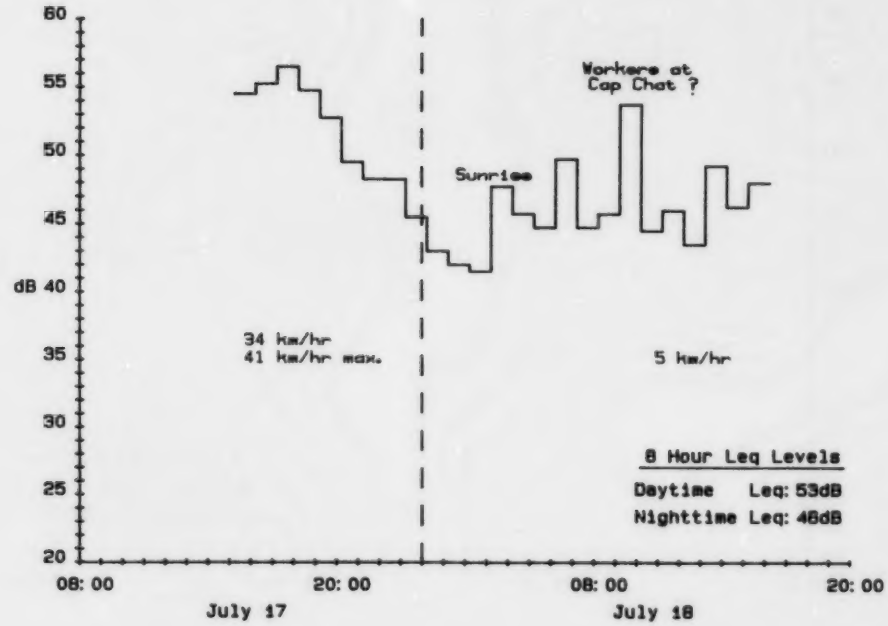

Fig. 23. One hour L_{eq} levels for site number 10, July 17-18

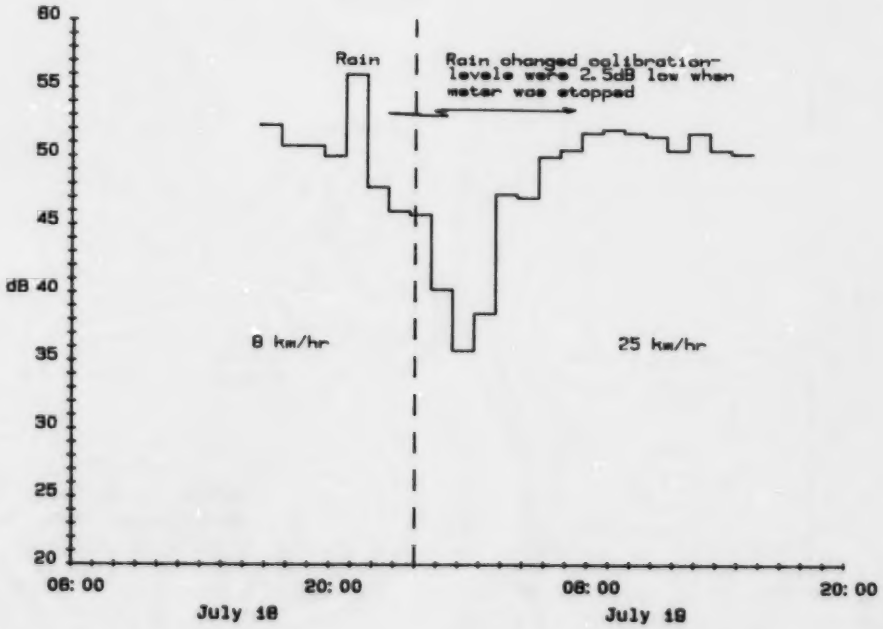

Fig. 24. One hour L_{eq} levels for site number 10, July 18-19

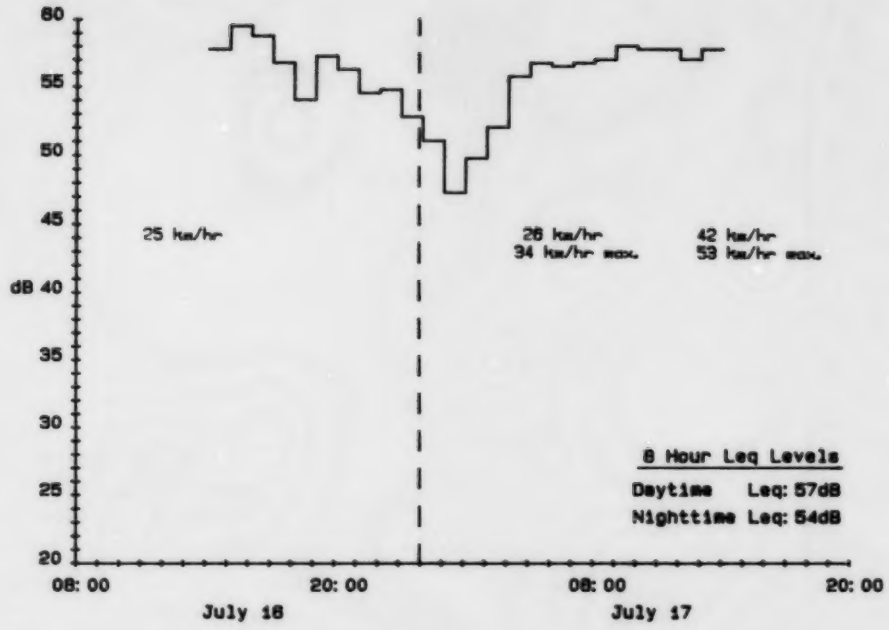

Fig. 25. One hour L_{eq} levels for site number 11, July 16-17

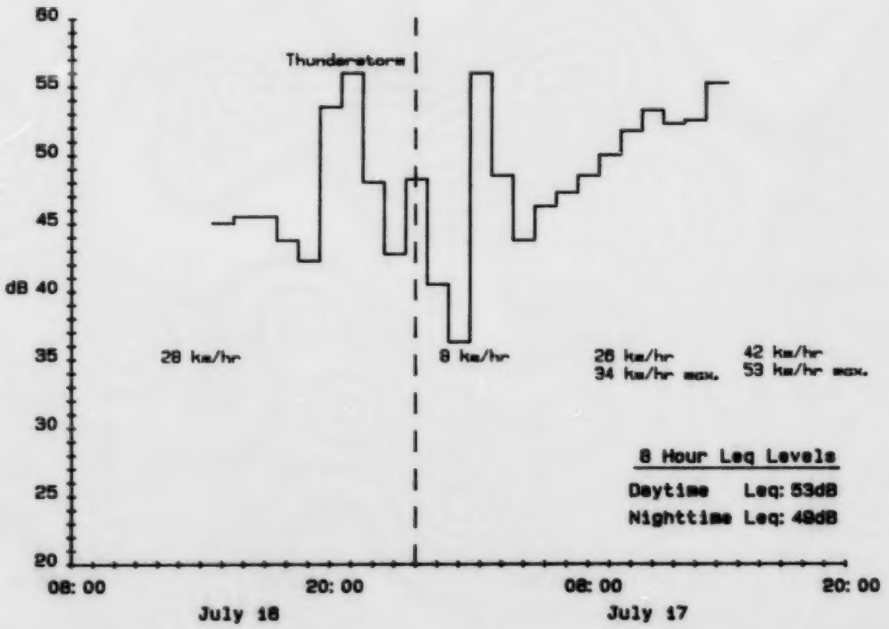

Fig. 26. One hour L_{eq} levels for site number 12, July 16-17

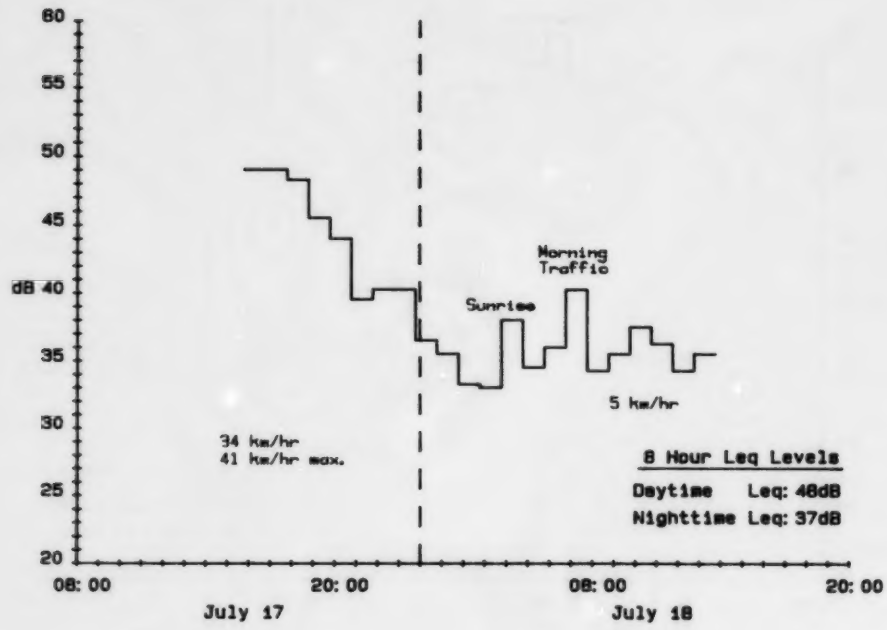

Fig. 27. One hour L_{eq} levels for site number 12, July 17-18

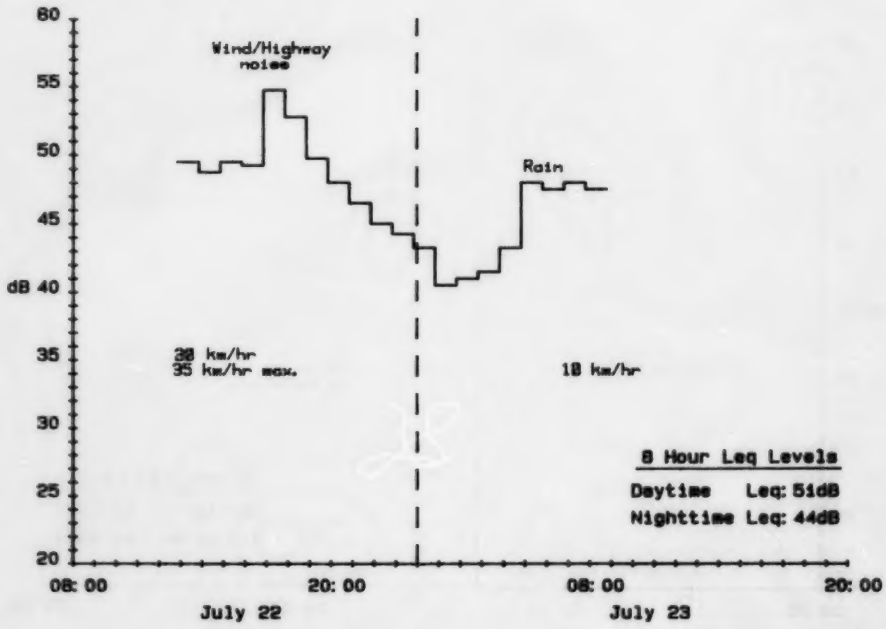

Fig. 28. One hour L_{eq} levels for site number 12, July 22-23

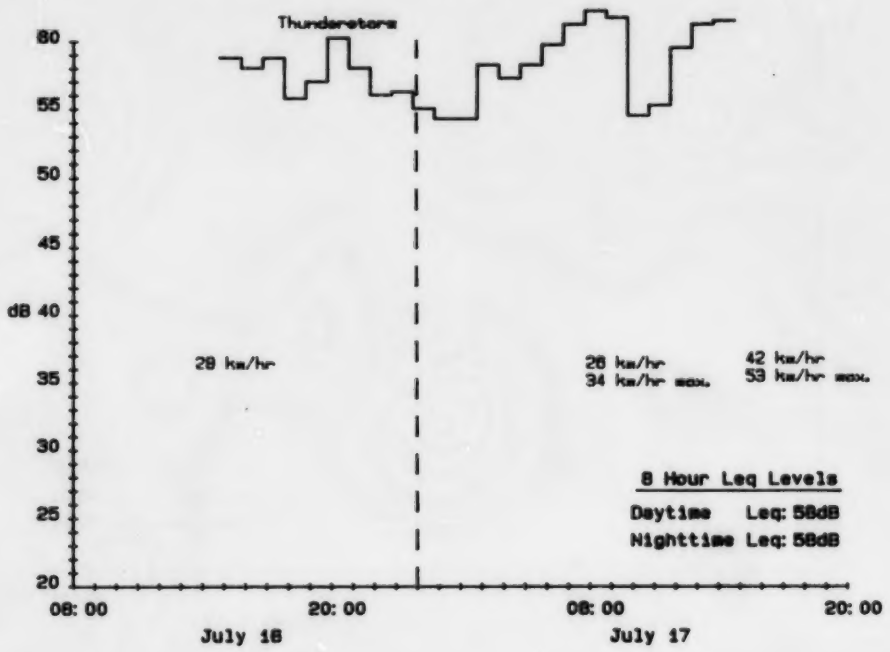

Fig. 29. One hour L_{eq} levels for site number 13, July 16-17

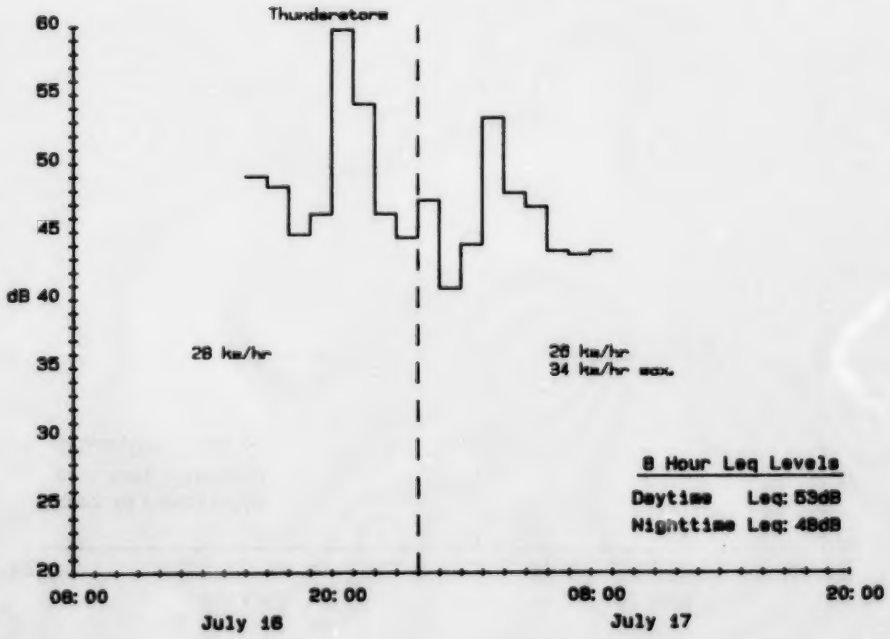

Fig. 30. One hour L_{eq} levels for site number 14, July 16-17

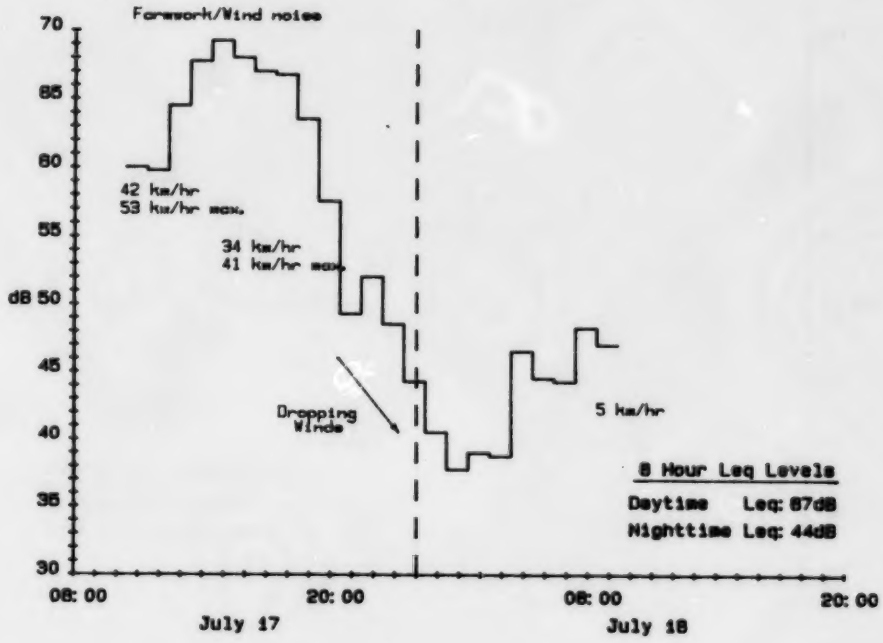

Fig. 31. One hour L_{eq} levels for site number 14, July 17-18

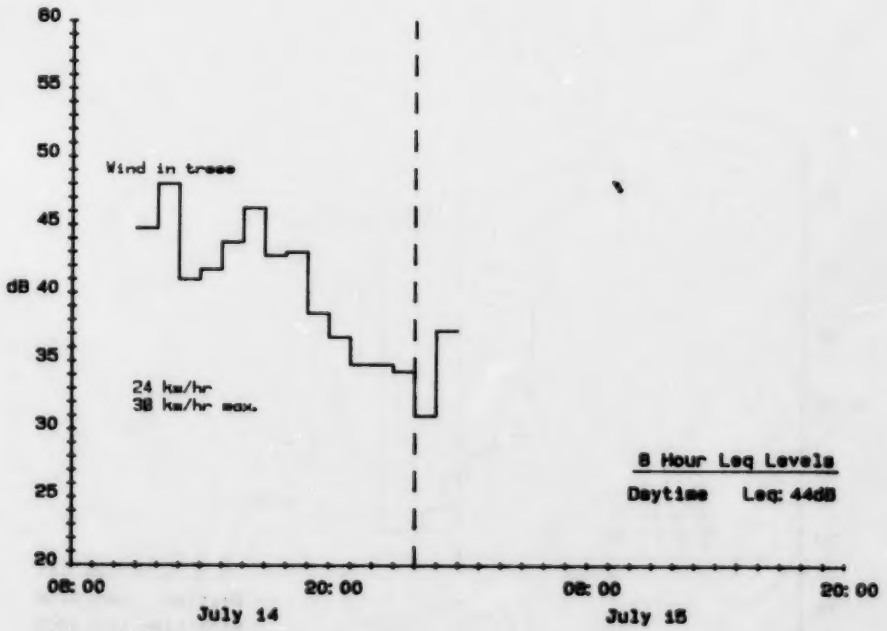

Fig. 32. One hour L_{eq} levels for site number 15, July 14-15

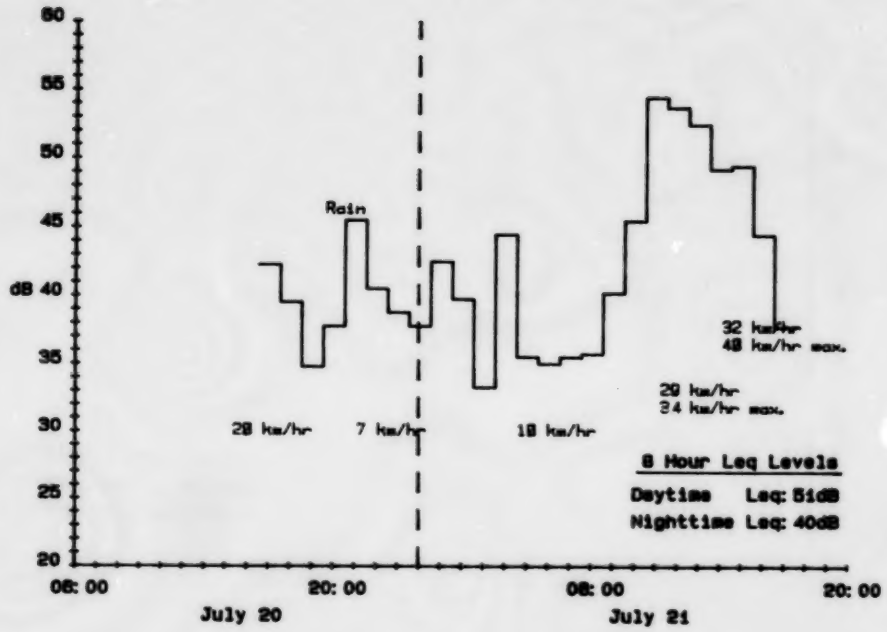

Fig. 33. One hour L_{eq} levels for site number 15, July 20-21

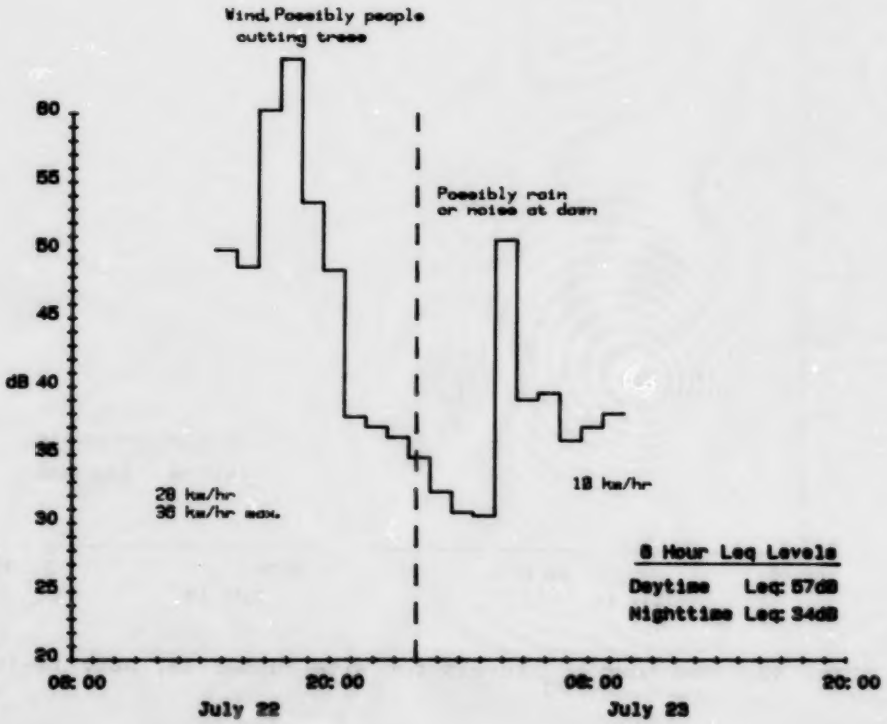

Fig. 34. One hour L_{eq} levels for site number 15, July 22-23

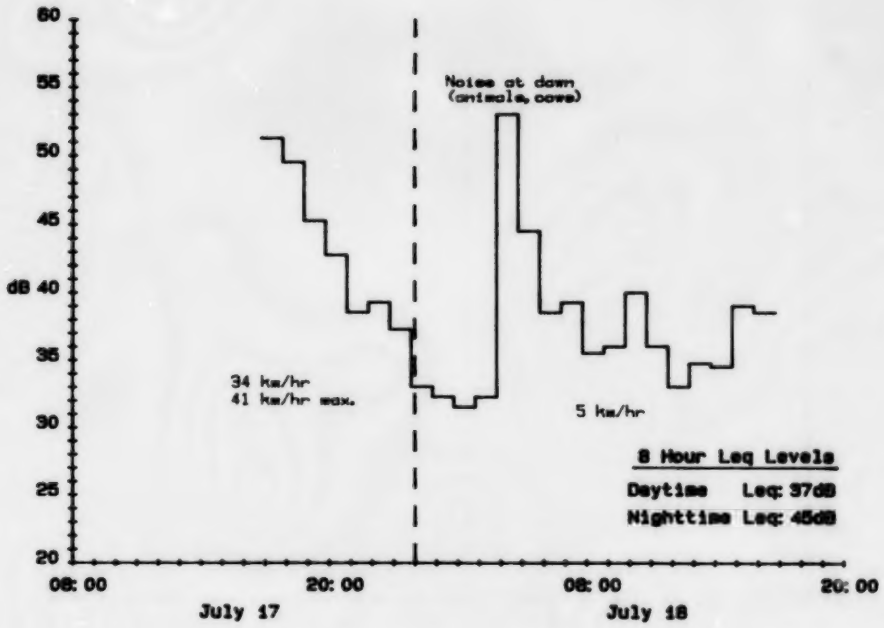

Fig. 35. One hour L_{eq} levels for site number 16, July 17-18

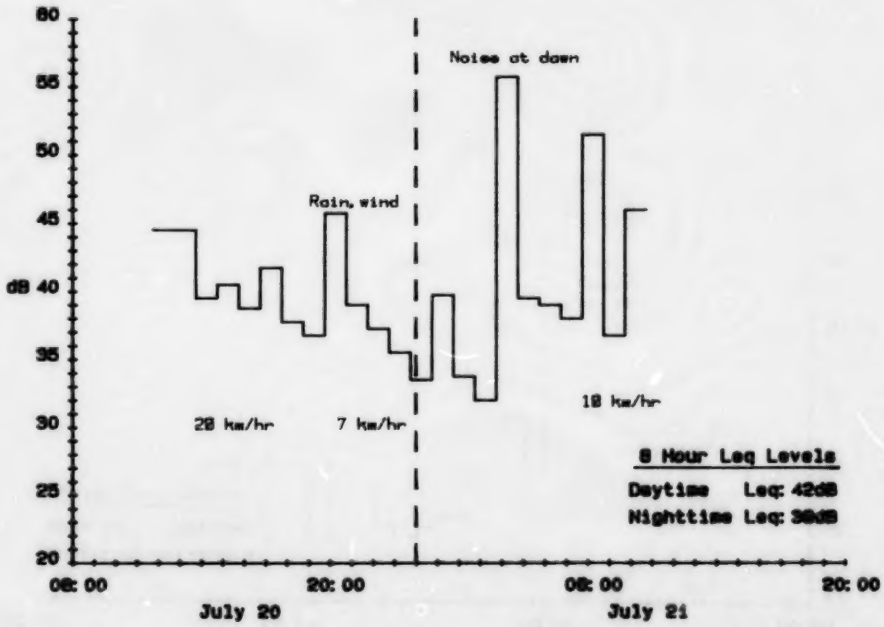

Fig. 36. One hour L_{eq} levels for site number 16, July 20-21

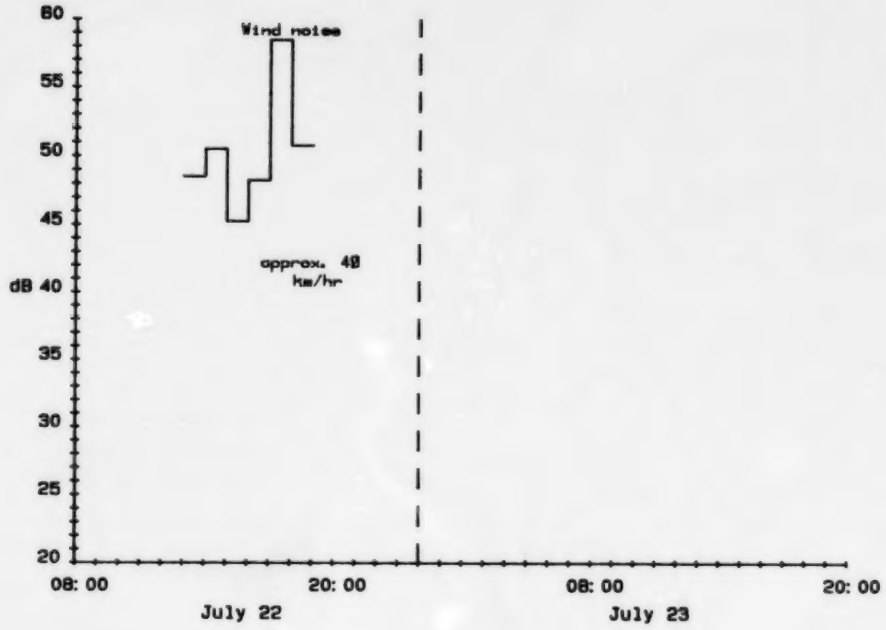

Fig. 37. One hour L_{eq} levels for site number 16, July 22-23

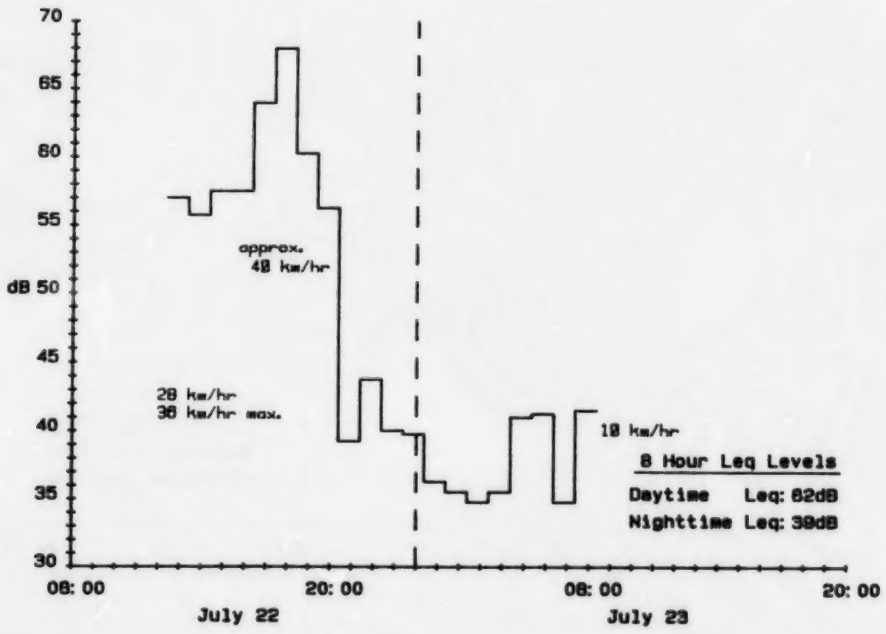

Fig. 38. One hour L_{eq} levels for site number 19, July 22-23

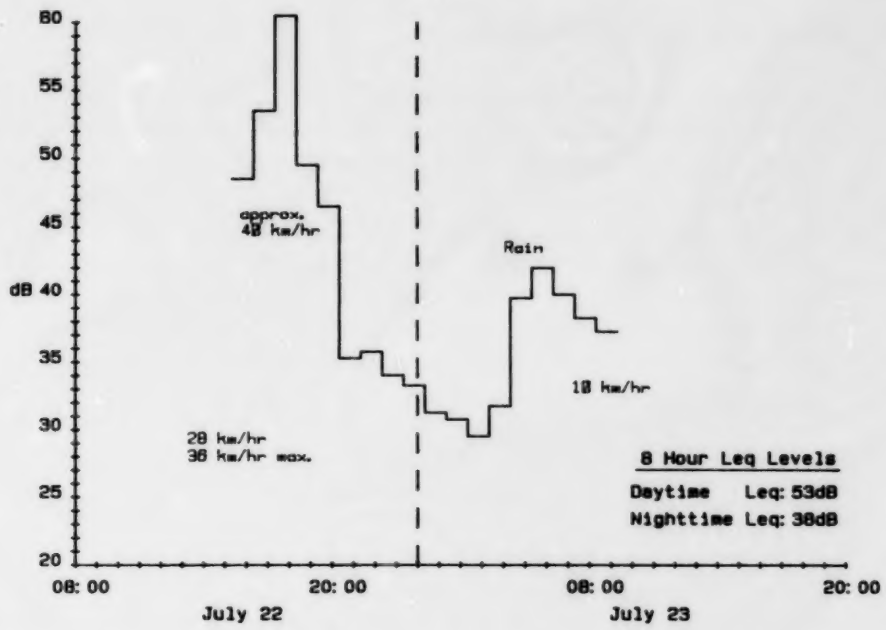

Fig. 39. One hour L_{eq} levels for site number 20, July 22-23

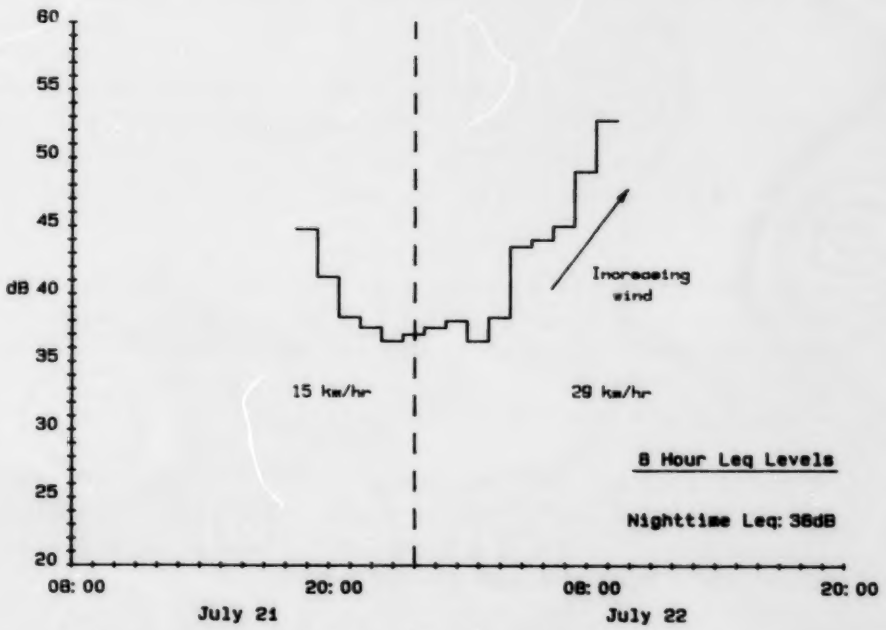

Fig. 40. One hour L_{eq} levels for site number 21, July 21-22

5.1.1 Results of L_{eq} Measurements

Site 1 Variations of day- and nighttime 1-h L_{eq} levels in a forest of coniferous and deciduous trees are shown in Figures 3 and 4. During the two days shown, L_{eq} levels varied from 33 to 53 dB. The measurements shown in Figure 3 were taken when the wind was blowing from the west at 24 to 30 km/h during the day and it was raining during the night. The activities of a nearby farm were likely responsible for the high noise levels between 1300 and 1600 hours in Figure 3. The noise generated by the wind in the presence of trees varies from 40 to 45 dBA during the day. High nighttime noise levels indicated in the Figure from 0200 to 0500 hours were caused by rain. Even in Figure 4 the levels are high during the evening hours due to farm activity. The night levels reached a peak of 50 dB as the result of a combination of rain and high winds.

Site 2 Due to instrumentation problems caused by rain only 8 h of L_{eq} levels were recorded as shown in Figure 5. The levels cover the period from 1200 to 2000 hours with the wind speed varying from 24 to 30 km/h. Since this site is situated in an area of long grass and small bushes, the Leq levels are low in spite of moderate winds. Even Figures 6 and 7 show low levels at moderate wind speeds. The high peak shown in Figure 6 at 2100 hours is due to a storm.

Site 3 The variation of L_{eq} levels with wind speed can be observed clearly in Figures 8 and 9. The measurement point was located in an area of long grass on the top of a hill. Since there are no trees in the nearby areas, L_{eq} levels are low even at high wind speeds.

Site 4 Since the first measurements were made only 5 m away from deciduous trees, the L_{eq} levels in Figure 10 are slightly higher than the levels shown in Figure 11, which were measured at a point 30 m from the trees. Because of the absence of winds the nighttime levels are low in Figure 11.

Site 5 Since this measurement point was close to a farm, the daytime L_{eq} levels are high in Figures 12 to 14. The farmer was using a tractor and other farm equipment occasionally in a field, about 100 m from the measurement point.

Site 6 This point was in the village of Petit-Fonds and was 25 m from trees and 10 m from a dirt road. The daytime L_{eq} levels are around 50 dB in Figures 15 and 16.

Site 7 — Because this site is in the middle of the residential area of Cap Chat village, the day- and nighttime levels are high as shown in Figures 17 to 19. There is considerable activity in this area. Noise is produced by incoming and outgoing cars, children playing outside, radios, etc. The nighttime levels in Figure 18 are unusually high, probably due to wind and activities in the village. Since this area is about 3 km from the ÉOLE site, it is unlikely that the noise from the turbine will cause an increase in the background noise levels.

Sites 8 to 14 — Hourly L_{eq} levels for measurement points 8 to 14 are shown in Figures 20 to 31. All of these points were within a distance of 25 to 300 m from Highway 132. As these points were close to the highway, L_{eq} levels are high. The figures show daytime L_{eq} levels are between 50 and 60 dB and nighttime levels are above 45 dB. In Figure 31, daytime L_{eq} levels rose to 68 dB, because of regular farmwork close to the highway.

Site 15 — Since this measurement point was close to the tree line, L_{eq} levels vary with wind speeds as indicated by Figures 32 and 33. Some of the hourly Leq levels are above 49 dB during the daytime in Figure 33 because of higher wind speeds. During the same hours the levels are between 40 and 45 dB in Figure 32 due to lower wind speeds.

Site 16 — Since this point is 0.75 km from the highway the hourly L_{eq} levels are low in Figures 35 and 36. The peaks during the early morning hours in the two figures were caused by the noise generated by insects, birds, and other animals at dawn.

Site 19 — This point was in a field of long grass 0.6 km away from Highway 132. The noise levels are not expected to be significantly influenced by highway traffic noise (Figure 38). The levels were high during the daytime when there were strong winds then dropped significantly at night when the winds were light.

Sites 20 and 21 — These two sites have similar geography. The daytime levels are high in Figure 39 for site 20 due to strong winds. The noise from highway traffic is not expected to significantly influence background noise levels at these sites.

5.1.2 Results of Statistical Analyses

The results of the statistical analyses carried out on background noise using a B&K Statistical Analyzer are presented in Tables 1 to 17. These measurements were conducted during the daytime and were usually

½ or 1 h in duration. All the points were covered with the exception of points 3, 19, and 20.

The time interval during which the measurements were made for statistical analyses is indicated above the table. The first line in the table shows the time on the printer clock and the number of samples taken during the measurements period. The next six lines are the levels that were exceeded for 1%, 5%, 10%, 50%, 90%, and 95% of the time interval. The following line shows the L_{eq} level for the time interval. In the succeeding lines the duration of the indicated levels in 2 dB intervals are shown as a percentage of the total time period.

5.2 Variation of Background Noise with Wind Speed

Since wind generated noise levels vary with the speed of the wind, attempts have been made to correlate the measured L_{eq} levels with wind speed under various ground conditions. The wind speed was monitored from a standard 10-m tower about 500 m from the ÉOLE site. Wind speed data were also collected from the meteorological observatories in Mont Joli and Gaspé. Since some of the data on wind speed were interpolated, the results shown here should be taken as indicative of trends.

Noise generated by the wind varies with the local ground conditions. Natural wind noise is generated by the turbulence in the wind. The noise generated by trees is due to the rustling of leaves and shedding of vortices generated by the trunk and the branches. Noise is also generated by vortex shedding from microphones and wind screens.

Groupings of sites having similar conditions are shown in Table 18 and frequent levels at these sites are shown in Table 19. The numbers inside the parentheses indicate maximum levels observed during the present set of measurements.

The variation of noise levels with wind speed is shown in Figure 41 for site 3 which was in a field of grass 1 km from the ÉOLE site. The variation can be approximated by a straight line. The background noise level at the wind speed corresponding to the maximum operating capacity of the turbine exceeds 60 dB at this site. Background noise levels at this speed can be expected to mask the noise generated by the turbine.

Figure 42 shows the variation of noise levels with wind speed near trees. Also shown in the figure is the line showing the variation of noise levels in the open field from the previous figure. The noise levels near trees appear to be 2 to 10 dB higher than the levels in the open field under similar wind speed conditions. Larger differences are indicated at

Table 1. Statistical analyses at site 8 on July 16

0835–1035	1038–1138	1140–1240
00:01:06 S=36000	00:02:09 S=36000	00:03:12 S=36000
L0001=076.3DB	L0001=073.8DB	L0001=062.3DB
L0005=068.3DB	L0005=068.3DB	L0005=057.8DB
L0010=065.8DB	L0010=064.8DB	L0010=055.8DB
L0050=054.8DB	L0050=052.5DB	L0050=047.0DB
L0090=044.5DB	L0090=043.8DB	L0090=041.8DB
L0095=042.3DB	L0095=042.3DB	L0095=040.5DB
LEQ=062.9DB	LEQ=061.1DB	LEQ=052.8DB
D026.0DB=000.0%	D026.0DB=000.0%	D026.0DB=000.0%
D028.0DB=000.0%	D028.0DB=000.0%	D028.0DB=000.0%
D030.0DB=000.0%	D030.0DB=000.0%	D030.0DB=000.0%
D032.0DB=000.0%	D032.0DB=000.0%	D032.0DB=000.0%
D034.0DB=000.5%	D034.0DB=000.0%	D034.0DB=000.0%
D036.0DB=001.0%	D036.0DB=000.0%	D036.0DB=000.3%
D038.0DB=001.0%	D038.0DB=001.0%	D038.0DB=003.2%
D040.0DB=001.9%	D040.0DB=004.0%	D040.0DB=008.1%
D042.0DB=003.9%	D042.0DB=005.8%	D042.0DB=014.2%
D044.0DB=005.5%	D044.0DB=008.3%	D044.0DB=016.9%
D046.0DB=008.7%	D046.0DB=009.0%	D046.0DB=014.0%
D048.0DB=010.8%	D048.0DB=008.5%	D048.0DB=012.4%
D050.0DB=008.0%	D050.0DB=010.1%	D050.0DB=009.7%
D052.0DB=008.1%	D052.0DB=010.6%	D052.0DB=007.4%
D054.0DB=010.4%	D054.0DB=009.0%	D054.0DB=004.6%
D056.0DB=005.6%	D056.0DB=006.2%	D056.0DB=002.8%
D058.0DB=005.6%	D058.0DB=006.2%	D058.0DB=001.9%
D060.0DB=005.5%	D060.0DB=003.5%	D060.0DB=001.2%
D062.0DB=005.3%	D062.0DB=004.2%	D062.0DB=000.7%
D064.0DB=006.7%	D064.0DB=004.8%	D064.0DB=000.3%
D066.0DB=003.5%	D066.0DB=001.6%	D066.0DB=000.0%
D068.0DB=001.9%	D068.0DB=002.3%	D068.0DB=000.0%
D070.0DB=001.0%	D070.0DB=001.0%	D070.0DB=000.0%
D072.0DB=000.3%	D072.0DB=000.8%	D072.0DB=000.0%
D074.0DB=000.3%	D074.0DB=000.3%	D074.0DB=000.0%
D076.0DB=000.7%	D076.0DB=000.0%	D076.0DB=000.0%
D078.0DB=000.1%	D078.0DB=000.0%	D078.0DB=000.0%
D080.0DB=000.0%	D080.0DB=000.0%	D080.0DB=000.0%
D082.0DB=000.0%	D082.0DB=000.0%	D082.0DB=000.0%
D084.0DB=000.0%	D084.0DB=000.0%	D084.0DB=000.0%
D086.0DB=000.0%	D086.0DB=000.0%	D086.0DB=000.0%
D088.0DB=000.0%	D088.0DB=000.0%	0DB=000.0%

Table 2. Statistical analyses at site 8 on July 16

1243–1343	1345–1445	1447–1547
00:04:14 S=36000	00:05:16 S=36000	00:06:18 S=36000
L0001=064.3DB	L0001=077.3DB	L0001=062.8DB
L0005=059.3DB	L0005=070.5DB	L0005=058.0DB
L0010=056.3DB	L0010=067.8DB	L0010=055.8DB
L0050=048.5DB	L0050=054.5DB	L0050=049.0DB
L0090=043.5DB	L0090=047.5DB	L0090=044.0DB
L0095=042.3DB	L0095=046.5DB	L0095=042.8DB
LEQ=054.5DB	LEQ=064.5DB	LEQ=052.8DB
D026.0DB=000.0%	D026.0DB=000.0%	D026.0DB=000.0%
D028.0DB=000.0%	D028.0DB=000.0%	D028.0DB=000.0%
D030.0DB=000.0%	D030.0DB=000.0%	D030.0DB=000.0%
D032.0DB=000.0%	D032.0DB=000.0%	D032.0DB=000.0%
D034.0DB=000.0%	D034.0DB=000.0%	D034.0DB=000.0%
D036.0DB=000.0%	D036.0DB=000.0%	D036.0DB=000.0%
D038.0DB=000.8%	D038.0DB=000.0%	D038.0DB=000.5%
D040.0DB=003.7%	D040.0DB=000.0%	D040.0DB=002.6%
D042.0DB=009.0%	D042.0DB=000.1%	D042.0DB=007.2%
D044.0DB=015.4%	D044.0DB=003.2%	D044.0DB=014.2%
D046.0DB=017.0%	D046.0DB=009.6%	D046.0DB=017.2%
D048.0DB=014.9%	D048.0DB=010.4%	D048.0DB=016.9%
D050.0DB=010.8%	D050.0DB=011.5%	D050.0DB=012.9%
D052.0DB=009.7%	D052.0DB=012.2%	D052.0DB=010.4%
D054.0DB=006.7%	D054.0DB=008.8%	D054.0DB=007.4%
D056.0DB=003.7%	D056.0DB=007.1%	D056.0DB=004.2%
D058.0DB=002.4%	D058.0DB=006.2%	D058.0DB=002.1%
D060.0DB=001.7%	D060.0DB=004.6%	D060.0DB=001.2%
D062.0DB=000.8%	D062.0DB=004.2%	D062.0DB=000.5%
D064.0DB=000.5%	D064.0DB=006.7%	D064.0DB=000.3%
D066.0DB=000.1%	D066.0DB=003.9%	D066.0DB=000.1%
D068.0DB=000.0%	D068.0DB=003.5%	D068.0DB=000.0%
D070.0DB=000.0%	D070.0DB=002.1%	D070.0DB=000.0%
D072.0DB=000.0%	D072.0DB=001.2%	D072.0DB=000.0%
D074.0DB=000.0%	D074.0DB=000.8%	D074.0DB=000.0%
D076.0DB=000.0%	D076.0DB=000.7%	D076.0DB=000.0%
D078.0DB=000.0%	D078.0DB=000.7%	D078.0DB=000.0%
D080.0DB=000.0%	D080.0DB=000.0%	D080.0DB=000.0%
D082.0DB=000.0%	D082.0DB=000.0%	D082.0DB=000.0%
D084.0DB=000.0%	D084.0DB=000.0%	D084.0DB=000.0%
D086.0DB=000.0%	D086.0DB=000.0%	D086.0DB=000.0%
D088.0DB=000.0%	D088.0DB=000.0%	D088.0DB=000.0%

Table 3. Statistical analyses at site 8 on July 16

1549-1649	1652-1752	1754-1854
00:07:20 S=36000	00:08:23 S=36000	00:09:25 S=36000
L0001=072.3DB	L0001=064.3DB	L0001=064.3DB
L0005=062.3DB	L0005=059.0DB	L0005=058.0DB
L0010=058.5DB	L0010=057.0DB	L0010=056.3DB
L0050=053.3DB	L0050=052.8DB	L0050=051.8DB
L0090=049.3DB	L0090=049.0DB	L0090=049.0DB
L0095=047.5DB	L0095=049.5DB	L0095=046.3DB
LEQ=060.0DB	LEQ=055.0DB	LEQ=057.9DB
0026.0DB=000.0%	0026.0DB=000.0%	0026.0DB=000.0%
0028.0DB=000.0%	0028.0DB=000.0%	0028.0DB=000.0%
0030.0DB=000.0%	0030.0DB=000.0%	0030.0DB=000.0%
0032.0DB=000.0%	0032.0DB=000.0%	0032.0DB=000.0%
0034.0DB=000.0%	0034.0DB=000.0%	0034.0DB=000.0%
0036.0DB=000.0%	0036.0DB=000.0%	0036.0DB=000.0%
0038.0DB=000.0%	0038.0DB=000.0%	0038.0DB=000.7%
0040.0DB=000.0%	0040.0DB=000.0%	0040.0DB=001.6%
0042.0DB=000.3%	0042.0DB=000.0%	0042.0DB=001.0%
0044.0DB=001.9%	0044.0DB=000.0%	0044.0DB=001.2%
0046.0DB=003.3%	0046.0DB=000.0%	0046.0DB=001.7%
0048.0DB=006.2%	0048.0DB=010.4%	0048.0DB=016.7%
0050.0DB=024.9%	0050.0DB=029.1%	0050.0DB=032.3%
0052.0DB=028.6%	0052.0DB=029.0%	0052.0DB=023.1%
0054.0DB=015.4%	0054.0DB=016.3%	0054.0DB=010.4%
0056.0DB=006.9%	0056.0DB=007.1%	0056.0DB=005.1%
0058.0DB=003.7%	0058.0DB=003.5%	0058.0DB=002.3%
0060.0DB=001.7%	0060.0DB=001.4%	0060.0DB=001.0%
0062.0DB=000.8%	0062.0DB=001.0%	0062.0DB=000.5%
0064.0DB=001.0%	0064.0DB=000.3%	0064.0DB=000.3%
0066.0DB=001.0%	0066.0DB=000.1%	0066.0DB=000.1%
0068.0DB=000.5%	0068.0DB=000.0%	0068.0DB=000.1%
0070.0DB=000.1%	0070.0DB=000.0%	0070.0DB=000.0%
0072.0DB=000.3%	0072.0DB=000.0%	0072.0DB=000.0%
0074.0DB=000.0%	0074.0DB=000.0%	0074.0DB=000.0%
0076.0DB=000.1%	0076.0DB=000.0%	0076.0DB=000.0%
0078.0DB=000.3%	0078.0DB=000.0%	0078.0DB=000.0%
0080.0DB=000.0%	0080.0DB=000.0%	0080.0DB=000.0%
0082.0DB=000.0%	0082.0DB=000.0%	0082.0DB=000.0%
0084.0DB=000.0%	0084.0DB=000.0%	0084.0DB=000.0%
0086.0DB=000.0%	0086.0DB=000.0%	0086.0DB=000.0%
0088.0DB=000.0%	0088.0DB=000.0%	0088.0DB=000.0%

Table 4. Statistical analyses at site 8 on July 16

1858-1958	1958-2058
00:10:27 S=36000	00:11:29 S=36000
L0001=066.3DB	L0001=068.3DB
L0005=060.5DB	L0005=062.0DB
L0010=057.5DB	L0010=059.3DB
L0050=048.8DB	L0050=049.5DB
L0090=042.0DB	L0090=042.5DB
L0095=040.8DB	L0095=041.3DB
LEQ=056.5DB	LEQ=058.8DB
0026.0DB=000.0%	0026.0DB=000.0%
0028.0DB=000.0%	0028.0DB=000.0%
0030.0DB=000.0%	0030.0DB=000.0%
0032.0DB=000.0%	0032.0DB=000.0%
0034.0DB=000.0%	0034.0DB=000.0%
0036.0DB=000.5%	0036.0DB=000.0%
0038.0DB=002.6%	0038.0DB=001.4%
0040.0DB=007.2%	0040.0DB=007.1%
0042.0DB=010.3%	0042.0DB=011.2%
0044.0DB=012.1%	0044.0DB=011.3%
0046.0DB=012.6%	0046.0DB=010.8%
0048.0DB=012.2%	0048.0DB=010.1%
0050.0DB=010.8%	0050.0DB=009.9%
0052.0DB=009.4%	0052.0DB=009.7%
0054.0DB=007.1%	0054.0DB=007.8%
0056.0DB=005.1%	0056.0DB=005.6%
0058.0DB=003.3%	0058.0DB=004.8%
0060.0DB=001.9%	0060.0DB=003.3%
0062.0DB=001.2%	0062.0DB=001.9%
0064.0DB=000.7%	0064.0DB=001.0%
0066.0DB=000.3%	0066.0DB=000.5%
0068.0DB=000.1%	0068.0DB=000.3%
0070.0DB=000.0%	0070.0DB=000.1%
0072.0DB=000.0%	0072.0DB=000.0%
0074.0DB=000.0%	0074.0DB=000.0%
0076.0DB=000.0%	0076.0DB=000.0%
0078.0DB=000.0%	0078.0DB=000.0%
0080.0DB=000.0%	0080.0DB=000.0%
0082.0DB=000.0%	0082.0DB=000.0%
0084.0DB=000.0%	0084.0DB=000.0%
0086.0DB=000.0%	0086.0DB=000.0%
0088.0DB=000.0%	0088.0DB=000.0%

Table 5. Statistical analyses at various sites on July 17

Site 2 1031-1131	Site 5 0849-0949	Site 6 1145-1245
11:11:51 S=36000	10:10:23 S=36000	12:12:46 S=36000
0001=062.3DB	0001=056.3DB	0001=074.3DB
0005=058.0DB	0005=051.5DB	0005=067.8DB
0010=056.0DB	0010=049.5DB	0010=063.5DB
0050=050.8DB	0050=042.0DB	0050=052.8DB
0090=047.8DB	0090=037.0DB	0090=048.5DB
0095=046.0DB	0095=036.0DB	0095=047.8DB
LEQ=053.2DB	LEQ=047.1DB	LEQ=062.8DB
0026.0DB=000.0%	0026.0DB=000.0%	0026.0DB=000.0%
0028.0DB=000.0%	0028.0DB=000.0%	0028.0DB=000.0%
0030.0DB=000.0%	0030.0DB=000.0%	0030.0DB=000.0%
0032.0DB=000.0%	0032.0DB=000.5%	0032.0DB=000.0%
0034.0DB=000.0%	0034.0DB=004.4%	0034.0DB=000.0%
0036.0DB=000.0%	0036.0DB=011.7%	0036.0DB=000.0%
0038.0DB=000.0%	0038.0DB=015.4%	0038.0DB=000.0%
0040.0DB=000.0%	0040.0DB=017.2%	0040.0DB=000.0%
0042.0DB=001.2%	0042.0DB=015.6%	0042.0DB=000.0%
0044.0DB=001.4%	0044.0DB=011.3%	0044.0DB=000.3%
0046.0DB=012.4%	0046.0DB=008.0%	0046.0DB=006.0%
0048.0DB=022.4%	0048.0DB=006.4%	0048.0DB=017.9%
0050.0DB=023.3%	0050.0DB=003.9%	0050.0DB=019.5%
0052.0DB=016.3%	0052.0DB=001.9%	0052.0DB=016.5%
0054.0DB=009.2%	0054.0DB=000.8%	0054.0DB=010.1%
0056.0DB=004.9%	0056.0DB=000.3%	0056.0DB=007.6%
0058.0DB=002.3%	0058.0DB=000.1%	0058.0DB=004.9%
0060.0DB=001.2%	0060.0DB=000.1%	0060.0DB=003.3%
0062.0DB=000.5%	0062.0DB=000.0%	0062.0DB=002.6%
0064.0DB=000.1%	0064.0DB=000.0%	0064.0DB=002.4%
0066.0DB=000.0%	0066.0DB=000.0%	0066.0DB=001.7%
0068.0DB=000.0%	0068.0DB=000.0%	0068.0DB=001.4%
0070.0DB=000.0%	0070.0DB=000.0%	0070.0DB=001.0%
0072.0DB=000.0%	0072.0DB=000.0%	0072.0DB=000.8%
0074.0DB=000.0%	0074.0DB=000.0%	0074.0DB=000.3%
0076.0DB=000.0%	0076.0DB=000.0%	0076.0DB=000.1%
0078.0DB=000.0%	0078.0DB=000.0%	0078.0DB=000.1%
0080.0DB=000.0%	0080.0DB=000.0%	0080.0DB=000.0%
0082.0DB=000.0%	0082.0DB=000.0%	0082.0DB=000.0%
0084.0DB=000.0%	0084.0DB=000.0%	0084.0DB=000.0%
0086.0DB=000.0%	0086.0DB=000.0%	0086.0DB=000.0%
0088.0DB=000.0%	0088.0DB=000.0%	0088.0DB=000.0%

Table 6. Statistical analyses at various sites on July 17

Site 7 1352-1452	Site 9 1507-1607	Site 11 1621-1721
11:11:54 S=36000	16:16:07 S=36000	17:17:21 S=36000
0001=067.3DB	0001=065.3DB	0001=075.3DB
0005=061.8DB	0005=062.5DB	0005=068.8DB
0010=059.8DB	0010=060.8DB	0010=066.5DB
0050=051.8DB	0050=055.8DB	0050=057.8DB
0090=048.5DB	0090=051.0DB	0090=051.0DB
0095=047.8DB	0095=049.8DB	0095=049.5DB
LEQ=056.7DB	LEQ=057.5DB	LEQ=063.7DB
0026.0DB=000.0%	0026.0DB=000.0%	0026.0DB=000.0%
0028.0DB=000.0%	0028.0DB=000.0%	0028.0DB=000.0%
0030.0DB=000.0%	0030.0DB=000.0%	0030.0DB=000.0%
0032.0DB=000.0%	0032.0DB=000.0%	0032.0DB=000.0%
0034.0DB=000.0%	0034.0DB=000.0%	0034.0DB=000.0%
0036.0DB=000.0%	0036.0DB=000.0%	0036.0DB=000.0%
0038.0DB=000.0%	0038.0DB=000.0%	0038.0DB=000.0%
0040.0DB=000.0%	0040.0DB=000.0%	0040.0DB=000.0%
0042.0DB=000.0%	0042.0DB=000.0%	0042.0DB=000.0%
0044.0DB=000.0%	0044.0DB=000.0%	0044.0DB=000.1%
0046.0DB=006.9%	0046.0DB=000.8%	0046.0DB=001.6%
0048.0DB=024.3%	0048.0DB=004.8%	0048.0DB=004.6%
0050.0DB=023.3%	0050.0DB=009.6%	0050.0DB=007.8%
0052.0DB=016.5%	0052.0DB=015.8%	0052.0DB=011.5%
0054.0DB=010.1%	0054.0DB=021.5%	0054.0DB=013.1%
0056.0DB=005.6%	0056.0DB=020.4%	0056.0DB=013.1%
0058.0DB=004.4%	0058.0DB=013.3%	0058.0DB=011.5%
0060.0DB=002.8%	0060.0DB=006.7%	0060.0DB=009.2%
0062.0DB=001.9%	0062.0DB=003.5%	0062.0DB=008.1%
0064.0DB=001.0%	0064.0DB=001.4%	0064.0DB=006.7%
0066.0DB=000.7%	0066.0DB=000.5%	0066.0DB=004.6%
0068.0DB=000.3%	0068.0DB=000.0%	0068.0DB=002.4%
0070.0DB=000.1%	0070.0DB=000.0%	0070.0DB=001.0%
0072.0DB=000.0%	0072.0DB=000.0%	0072.0DB=000.8%
0074.0DB=000.0%	0074.0DB=000.0%	0074.0DB=000.8%
0076.0DB=000.0%	0076.0DB=000.0%	0076.0DB=000.3%
0078.0DB=000.0%	0078.0DB=000.0%	0078.0DB=000.1%
0080.0DB=000.0%	0080.0DB=000.0%	0080.0DB=000.0%
0082.0DB=000.0%	0082.0DB=000.0%	0082.0DB=000.0%
0084.0DB=000.0%	0084.0DB=000.0%	0084.0DB=000.0%
0086.0DB=000.0%	0086.0DB=000.0%	0086.0DB=000.0%
0088.0DB=000.0%	0088.0DB=000.0%	0088.0DB=000.0%

Table 7. Statistical analyses at various sites on July 18

Site 1 1547-1647	Site 10 0852-1052	Site 12 1103-1203
00:16:47 S=36000	00:10:52	00:12:03 S=36000
I 0001=054.5DB	.S=36000	I 0001=049.3DB
I 0005=050.8DB	I 0001-050.5DB	I 0005=046.3DB
I 0010=045.5DB	I 0005 046.5DB	I 0010=044.3DB
I 0050=030.8DB	I 0010=044.5DB	I 0050=038.3DB
I 0090=026.3DB	I 0050 039.0DB	I 0090=032.0DB
I 0095=026.3DB	I 0090 035.0DB	I 0095=031.0DB
I EQ=043.0DB	I 0095=034.0DB	I 141.7DB
0026.0DB=013.7%	I EQ=042.1DB	=000.0%
0028.0DB=011.7%	0026.0DB=000.0%	0028.0DB 002.4%
0030.0DB=011.3%	0028.0DB=000.0%	0030.0DB=007.6%
0032.0DB=008.0%	0030.0DB=000.7%	0032.0DB=011.9%
0034.0DB=007.8%	0032.0DB=004.9%	0034.0DB=012.9%
0036.0DB=006.4%	0034.0DB=013.3%	0036.0DB=013.5%
0038.0DB=004.0%	0036.0DB 021.8%	0038.0DB=014.5%
0040.0DB=002.4%	0038.0DB=020.8%	0040 0DB=014.4%
0042.0DB=002.3%	0040.0DB=016.0%	0042.0DB=010.8%
0044.0DB=001.9%	0042.0DB=010.1%	0044.0DB=005.5%
0046.0DB=001.9%	0044.0DB=005.3%	0046.0DB=003.2%
0048.0DB=001.7%	0046.0DB=003.0%	0048.0DB=001.0%
0050.0DB=001.7%	0048.0DB=001.4%	0050.0DB=000.3%
0052.0DB=002.3%	0050.0DB 000.7%	0052.0DB=000.1%
0054.0DB=001.2%	0052.0DB=000.3%	0054.0DB=000.0%
0056.0DB=000.0%	0054.0DB 000.0%	0056.0DB=000.0%
0058.0DB=000.0%	0056.0DB 000.0%	0058.0DB=000.0%
0060.0DB=000.0%	0058.0DB 000.0%	0060.0DB=000.0%
0062.0DB=000.0%	0060.0DB=000.0%	0062.0DB=000.0%
0064.0DB=000.0%	0062.0DB=000.0%	0064.0DB=000.0%
0066.0DB=000.0%	0064.0DB=000.0%	0066.0DB=000.0%
0068.0DB=000.0%	0066.0DB=000.0%	0068 0DB=000.0%
0070.0DB=000.0%	0068 0DB=000.0%	0070.0DB=000.0%
0072.0DB=000.0%	0070.0DB 000.0%	0072.0DB=000.0%
0074.0DB=000.0%	0072.0DB 000.0%	0074.0DB=000.0%
0076.0DB=000.0%	0074.0DB 000.0%	0076.0DB=000.0%
0078.0DB=000.0%	0076 0DB=000.0%	0078.0DB=000.0%
0080.0DB=000.0%	0078.0DB=000.0%	0080.0DB=000.0%
0082.0DB=000.0%	0080.0DB=000.0%	0082.0DB=000.0%
0084.0DB=000.0%	0082 0DB=000.0%	0084.0DB=000.0%
0086.0DB=000.0%	0084.0DB 000.0%	0086.0DB=000.0%
0088.0DB=000.0%	0086.0DB 000.0%	0088.0DB=000.0%
	0088.0DB 000.0%	

Table 8. Statistical analyses at various sites on July 19

Site 13 1317-1417	Site 14 1428-1528
00:14:18 S=36000	00:15:30 S=36000
I 0001=072.3DB	I 0001=061.3DB
I 0005=066.5DB	I 0005=056.5DB
I 0010=064.0DB	I 0010=054.3DB
I 0050=044.5DB	I 0050=045.5DB
I 0090=033.0DB	I 0090=035.8DB
I 0095=031.8DB	I 0095=033.8DB
I EQ=060.5DB	I EQ=050.9DB
0026.0DB=000.0%	0026.0DB=000.0%
0028.0DB=000.8%	0028.0DB=000.0%
0030.0DB=005.1%	0030.0DB=001.7%
0032.0DB=008.5%	0032.0DB=003.7%
0034.0DB=008.7%	0034.0DB=005.3%
0036.0DB=008.5%	0036.0DB=006.9%
0038.0DB=006.4%	0038.0DB=008.1%
0040.0DB=005.1%	0040.0DB=008.5%
0042.0DB=004.8%	0042.0DB=008.7%
0044.0DB=004.2%	0044.0DB=009.0%
0046.0DB=003.7%	0046.0DB=010.1%
0048.0DB=003.5%	0048.0DB=009.9%
0050.0DB=003.2%	0050.0DB=008.8%
0052.0DB=003.2%	0052.0DB=007.1%
0054.0DB=003.3%	0054.0DB=004.4%
0056.0DB=003.7%	0056.0DB=002.6%
0058.0DB=004.6%	0058.0DB=001.2%
0060.0DB=005.1%	0060.0DB=000.8%
0062.0DB=005.5%	0062.0DB=000.1%
0064.0DB=004.8%	0064.0DB=000.0%
0066.0DB=002.1%	0066.0DB=000.0%
0068.0DB=001.0%	0068.0DB=000.0%
0070.0DB=001.0%	0070.0DB=000.0%
0072.0DB=000.5%	0072.0DB=000.0%
0074.0DB=000.3%	0074.0DB=000.0%
0076.0DB=000.1%	0076.0DB=000.0%
0078.0DB=000.0%	0078.0DB=000.0%
0080.0DB=000.0%	0080.0DB=000.0%
0082.0DB=000.0%	0082.0DB=000.0%
0084.0DB=000.0%	0084.0DB=000.0%
0086.0DB=000.0%	0086.0DB=000.0%
0088.0DB=000.0%	0088.0DB=000.0%

Table 9. Statistical analyses at various sites on July 19

Site 17 1515-1615	EOLE Site Office 1625-1725	July 18-19 Site 21 1730-0630
00:01:01 S=36000	00:02:12 S=36000	00:02:13 S=27000
L0001=055.3DB	L0001=058.3DB	L0001=066.8DB
L0005=051.8DB	L0005=054.0DB	L0005=058.3DB
L0010=049.8DB	L0010=051.8DB	L0010=053.3DB
L0050=042.8DB	L0050=044.0DB	L0050=048.5DB
L0090=038.3DB	L0090=038.8DB	L0090=026.3DB
L0095=037.5DB	L0095=037.5DB	L0095=026.3DB
LEQ=046.3DB	LEQ=049.6DB	LEQ=054.1DB
D026.0DB=000.0%	D026.0DB=000.0%	D026.0DB=005.8%
D028.0DB=000.0%	D028.0DB=000.0%	D028.0DB=004.1%
D030.0DB=000.0%	D030.0DB=000.0%	D030.0DB=004.6%
D032.0DB=000.0%	D032.0DB=000.0%	D032.0DB=005.4%
D034.0DB=001.5%	D034.0DB=001.4%	D034.0DB=005.6%
D036.0DB=005.3%	D036.0DB=005.6%	D036.0DB=006.6%
D038.0DB=017.2%	D038.0DB=010.8%	D038.0DB=007.3%
D040.0DB=018.3%	D040.0DB=015.1%	D040.0DB=007.9%
D042.0DB=015.6%	D042.0DB=016.5%	D042.0DB=009.1%
D044.0DB=012.8%	D044.0DB=014.7%	D044.0DB=008.1%
D046.0DB=009.9%	D046.0DB=011.0%	D046.0DB=006.4%
D048.0DB=007.1%	D048.0DB=008.3%	D048.0DB=004.7%
D050.0DB=004.8%	D050.0DB=006.0%	D050.0DB=004.2%
D052.0DB=002.6%	D052.0DB=003.9%	D052.0DB=002.3%
D054.0DB=001.8%	D054.0DB=002.4%	D054.0DB=002.1%
D056.0DB=000.3%	D056.0DB=001.2%	D056.0DB=001.6%
D058.0DB=000.1%	D058.0DB=000.5%	D058.0DB=001.4%
D060.0DB=000.0%	D060.0DB=000.3%	D060.0DB=001.0%
D062.0DB=000.0%	D062.0DB=000.0%	D062.0DB=000.7%
D064.0DB=000.0%	D064.0DB=000.0%	D064.0DB=000.5%
D066.0DB=000.0%	D066.0DB=000.0%	D066.0DB=000.4%
D068.0DB=000.0%	D068.0DB=000.0%	D068.0DB=000.3%
D070.0DB=000.0%	D070.0DB=000.0%	D070.0DB=000.1%
D072.0DB=000.0%	D072.0DB=000.0%	D072.0DB=000.1%
D074.0DB=000.0%	D074.0DB=000.0%	D074.0DB=000.0%
D076.0DB=000.0%	D076.0DB=000.0%	D076.0DB=000.0%
D078.0DB=000.0%	D078.0DB=000.0%	D078.0DB=000.0%
D080.0DB=000.0%	D080.0DB=000.0%	D080.0DB=000.0%
D082.0DB=000.0%	D082.0DB=000.0%	D082.0DB=000.0%
D084.0DB=000.0%	D084.0DB=000.0%	D084.0DB=000.0%
D086.0DB=000.0%	D086.0DB=000.0%	D086.0DB=000.0%
D088.0DB=000.0%	D088.0DB=000.0%	D088.0DB=000.0%

Table 10. Statistical analyses at various sites on July 21

Site 4 0827-0927	Site 8 0939-1039	Site 8 1222-1322
00:01:01	00:02:13 S=36000	00:02:89
.S=36000	L0001=071.3DB	.S=36000
L0001=050.8DB	L0005=064.3DB	L0001=062.8DB
L0005=048.0DB	L0010=059.5DB	L0005=059.5DB
L0010=046.3DB	L0050=052.0DB	L0010=058.0DB
L0050=038.3DB	L0090=050.3DB	L0050=053.0DB
L0090=029.0DB	L0095=049.8DB	L0090=048.8DB
L0095=027.0DB	LEQ=058.9DB	L0095=047.8DB
LEQ=042.5DB	D026.0DB=000.0%	LEQ=055.1DB
D026.0DB=004.8%	D028.0DB=000.0%	D026.0DB=000.0%
D028.0DB=005.6%	D030.0DB=000.0%	D028.0DB=000.0%
D030.0DB=004.1%	D032.0DB=000.0%	D030.0DB=000.0%
D032.0DB=003.8%	D034.0DB=000.0%	D032.0DB=000.0%
D034.0DB=009.4%	D036.0DB=000.0%	D034.0DB=000.0%
D036.0DB=009.7%	D038.0DB=000.0%	D036.0DB=000.0%
D038.0DB=012.4%	D040.0DB=000.0%	D038.0DB=000.0%
D040.0DB=011.2%	D042.0DB=000.0%	D040.0DB=000.0%
D042.0DB=008.7%	D044.0DB=000.0%	D042.0DB=000.0%
D044.0DB=006.9%	D046.0DB=000.0%	D044.0DB=000.7%
D046.0DB=005.8%	D048.0DB=008.8%	D046.0DB=005.6%
D048.0DB=003.8%	D050.0DB=042.8%	D048.0DB=013.7%
D050.0DB=001.6%	D052.0DB=021.1%	D050.0DB=020.2%
D052.0DB=003.1%	D054.0DB=007.4%	D052.0DB=020.8%
D054.0DB=000.8%	D056.0DB=005.6%	D054.0DB=016.7%
D056.0DB=000.8%	D058.0DB=001.8%	D056.0DB=011.3%
D058.0DB=000.8%	D060.0DB=002.1%	D058.0DB=005.8%
D060.0DB=000.8%	D062.0DB=000.7%	D060.0DB=002.4%
D062.0DB=000.8%	D064.0DB=000.5%	D062.0DB=000.7%
D064.0DB=000.8%	D066.0DB=001.2%	D064.0DB=000.1%
D066.0DB=000.0%	D068.0DB=000.8%	D066.0DB=000.0%
D068.0DB=000.0%	D070.0DB=000.7%	D068.0DB=000.0%
D070.0DB=000.0%	D072.0DB=000.5%	D070.0DB=000.0%
D072.0DB=000.0%	D074.0DB=000.1%	D072.0DB=000.0%
D074.0DB=000.0%	D076.0DB=000.0%	D074.0DB=000.0%
D076.0DB=000.0%	D078.0DB=000.0%	D076.0DB=000.0%
D078.0DB=000.0%	D080.0DB=000.0%	D078.0DB=000.0%
D080.0DB=000.0%	D082.0DB=000.0%	D080.0DB=000.0%
D082.0DB=000.0%	D084.0DB=000.0%	D082.0DB=000.0%
D084.0DB=000.0%	D086.0DB=000.0%	D084.0DB=000.0%
D086.0DB=000.0%	D088.0DB=000.0%	D086.0DB=000.0%
D088.0DB=000.0%		D088.0DB=000.0%

Table 11. Statistical analyses at various sites on July 21

Site 15 1348-1448	Site 16 1113-1213
00:03:52	
.S=36000	00:01:00 S=36000
I 0001=057.3DB	I 0001=060.5DB
I 0005=053.5DB	I 0005=058.3DB
I 0010=051.5DB	I 0010=057.3DB
L0050=046.0DB	I 0050=053.5DB
I 0090=042.5DB	L0090=050.5DB
I 0095=041.8DB	I 0095=049.8DB
LEQ=048.4DB	LEQ=054.1DB
0026.0DB=000.0%	0026.0DB=000.0%
0028.0DB=000.0%	0028.0DB=000.0%
0030.0DB=000.0%	0030.0DB=000.0%
0032.0DB=000.0%	0032.0DB=000.0%
0034.0DB=000.0%	0034.0DB=000.0%
0036.0DB=000.0%	0036.0DB=000.0%
0038.0DB=000.1%	0038.0DB=000.0%
0040.0DB=006.0%	0040.0DB=000.0%
0042.0DB=019.5%	0042.0DB=000.0%
0044.0DB=026.1%	0044.0DB=000.3%
0046.0DB=020.4%	0046.0DB=006.5%
0048.0DB=011.7%	0048.0DB=020.6%
0050.0DB=006.7%	0050.0DB=030.0%
0052.0DB=001.0%	0052.0DB=026.4%
0054.0DB=002.1%	0054.0DB=012.4%
0056.0DB=001.0%	0056.0DB=004.2%
0058.0DB=000.3%	0058.0DB=001.0%
0060.0DB=000.0%	0060.0DB=000.1%
0062.0DB=000.0%	0062.0DB=000.0%
0064.0DB=000.0%	0064.0DB=000.0%
0066.0DB=000.0%	0066.0DB=000.0%
0068.0DB=000.0%	0068.0DB=000.0%
0070.0DB=000.0%	0070.0DB=000.0%
0072.0DB=000.0%	0072.0DB=000.0%
0074.0DB=000.0%	0074.0DB=000.0%
0076.0DB=000.0%	0076.0DB=000.0%
0078.0DB=000.0%	0078.0DB=000.0%
0080.0DB=000.0%	0080.0DB=000.0%
0082.0DB=000.0%	0082.0DB=000.0%
0084.0DB=000.0%	0084.0DB=000.0%
0086.0DB=000.0%	0086.0DB=000.0%
0088.0DB=000.0%	0088.0DB=000.0%

Table 12. Statistical analyses at various sites on July 19

Site 2 0848-1018	Site 5 1044-1114	Site 7 (Loud Motor) 1137-1207
00:10:20 S=18000	00:11:16 S=18000	00:11:37
I 0001=058.3DB	I 0001=058.3DB	00:12:09 S=18000
I 0005=054.8DB	L0005=051.8DB	I 0001=082.3DB
I 0010=053.0DB	I 0010=049.3DB	I 0005=066.8DB
L0050=048.8DB	I 0050=041.5DB	I 0010=061.3DB
I 0090=045.5DB	I 0090=036.8DB	I 0050=048.0DB
I 0095=045.0DB	I 0095=035.8DB	I 0090=044.5DB
LEQ=056.5DB	LEQ=047.1DB	I 0095=043.8DB
0026.0DB=000.0%	26.0DB=000.0%	LEQ=069.6DB
0028.0DB=000.0%	0028.0DB=000.0%	0026.0DB=000.0%
0030.0DB=000.0%	0030.0DB=000.0%	0028.0DB=000.0%
0032.0DB=000.0%	0032.0DB=000.5%	0030.0DB=000.0%
0034.0DB=000.0%	0034.0DB=006.0%	0032.0DB=000.0%
0036.0DB=000.0%	0036.0DB=014.9%	0034.0DB=000.0%
0038.0DB=000.0%	0038.0DB=016.1%	0036.0DB=000.0%
0040.0DB=000.0%	0040.0DB=016.7%	0038.0DB=000.0%
0042.0DB=001.6%	0042.0DB=013.8%	0040.0DB=000.0%
0044.0DB=014.2%	0044.0DB=010.1%	0042.0DB=007.4%
0046.0DB=025.0%	0046.0DB=007.4%	0044.0DB=021.7%
0048.0DB=026.1%	0048.0DB=004.9%	0046.0DB=021.8%
0050.0DB=018.6%	0050.0DB=003.5%	0048.0DB=012.9%
0052.0DB=007.6%	0052.0DB=001.9%	0050.0DB=008.0%
0054.0DB=003.6%	0054.0DB=000.8%	0052.0DB=005.5%
0056.0DB=001.6%	0056.0DB=000.5%	0054.0DB=003.9%
0058.0DB=000.7%	0058.0DB=000.3%	0056.0DB=003.3%
0060.0DB=000.1%	0060.0DB=000.1%	0058.0DB=002.8%
0062.0DB=000.0%	0062.0DB=000.0%	0060.0DB=002.1%
0064.0DB=000.0%	0064.0DB=000.0%	0062.0DB=001.9%
0066.0DB=000.0%	0066.0DB=000.0%	0064.0DB=001.4%
0068.0DB=000.0%	0068.0DB=000.0%	0066.0DB=001.0%
0070.0DB=000.0%	0070.0DB=000.0%	0068.0DB=000.7%
0072.0DB=000.0%	0072.0DB=000.0%	0070.0DB=000.5%
0074.0DB=000.0%	0074.0DB=000.0%	0072.0DB=000.3%
0076.0DB=000.0%	0076.0DB=000.0%	0074.0DB=000.1%
0078.0DB=000.0%	0078.0DB=000.0%	0076.0DB=000.3%
0080.0DB=000.0%	0080.0DB=000.0%	0078.0DB=000.1%
0082.0DB=000.0%	0082.0DB=000.0%	0080.0DB=000.1%
0084.0DB=000.0%	0084.0DB=000.0%	0082.0DB=000.0%
0086.0DB=000.0%	0086.0DB=000.0%	0084.0DB=000.1%
0088.0DB=000.0%	0088.0DB=000.0%	0086.0DB=000.1%
		0088.0DB=000.5%

Table 13. Statistical analysis of seashore noise

Waves on Cap Chat, July 18 1350–1420

```
00:00:44 S=18000
L0001=070.0DB
L0005=068.5DB
L0010=067.8DB
L0050=065.5DB
L0090=063.3DB
L0095=062.8DB
LEQ=065.7DB
0026.0DB=000.0%
0028.0DB=000.0%
0030.0DB=000.0%
0032.0DB=000.0%
0034.0DB=000.0%
0036.0DB=000.0%
0038.0DB=000.0%
0040.0DB=000.0%
0042.0DB=000.0%
0044.0DB=000.0%
0046.0DB=000.0%
0048.0DB=000.0%
0050.0DB=000.0%
0052.0DB=000.0%
0054.0DB=000.0%
0056.0DB=000.0%
0058.0DB=000.0%
0060.0DB=001.9%
0062.0DB=019.3%
0064.0DB=043.4%
0066.0DB=026.5%
0068.0DB=007.2%
0070.0DB=000.8%
0072.0DB=000.0%
0074.0DB=000.0%
0076.0DB=000.0%
0078.0DB=000.0%
0080.0DB=000.0%
0082.0DB=000.0%
0084.0DB=000.0%
0086.0DB=000.0%
0088.0DB=000.0%
```

Table 14. Statistical analyses at various sites on July 20

Gravel Pit West of Site 7 1420–1440

```
00:14:51 S=18000
L0001=055.8DB
L0005=051.3DB
L0010=048.8DB
L0050=043.0DB
L0090=040.5DB
L0095=040.0DB
LEQ=046.5DB
0026.0DB=000.0%
0028.0DB=000.0%
0030.0DB=000.0%
0032.0DB=000.0%
0034.0DB=000.0%
0036.0DB=000.0%
0038.0DB=006.0%
0040.0DB=028.4%
0042.0DB=029.1%
0044.0DB=015.3%
0046.0DB=008.1%
0048.0DB=004.8%
0050.0DB=003.0%
0052.0DB=001.7%
0054.0DB=001.0%
0056.0DB=000.5%
0058.0DB=000.1%
0060.0DB=000.0%
0062.0DB=000.0%
0064.0DB=000.0%
0066.0DB=000.0%
0068.0DB=000.0%
0070.0DB=000.0%
0072.0DB=000.0%
0074.0DB=000.0%
0076.0DB=000.0%
0078.0DB=000.0%
0080.0DB=000.0%
0082.0DB=000.0%
0084.0DB=000.0%
0086.0DB=000.0%
0088.0DB=000.0%
```

Site 8 1325–1355

```
00:13:57 S=18000
L0001=061.8DB
L0005=057.3DB
L0010=055.0DB
L0050=047.8DB
L0090=043.0DB
L0095=042.0DB
LEQ=052.4DB
0026.0DB=000.0%
0028.0DB=000.0%
0030.0DB=000.0%
0032.0DB=000.0%
0034.0DB=000.0%
0036.0DB=000.0%
0038.0DB=000.3%
0040.0DB=004.9%
0042.0DB=012.2%
0044.0DB=016.7%
0046.0DB=017.7%
0048.0DB=015.3%
0050.0DB=010.8%
0052.0DB=008.5%
0054.0DB=005.3%
0056.0DB=002.8%
0058.0DB=001.9%
0060.0DB=001.0%
0062.0DB=000.5%
0064.0DB=000.1%
0066.0DB=000.0%
0068.0DB=000.0%
0070.0DB=000.0%
0072.0DB=000.0%
0074.0DB=000.0%
0076.0DB=000.0%
0078.0DB=000.0%
0080.0DB=000.0%
0082.0DB=000.0%
0084.0DB=000.0%
0086.0DB=000.0%
0088.0DB=000.0%
```

Site 12 1512–1542

```
00:15:14 S=18000
L0001=054.3DB
L0005=051.0DB
L0010=049.5DB
L0050=043.5DB
L0090=038.5DB
L0095=037.8DB
LEQ=046.6DB
0026.0DB=000.0%
0028.0DB=000.0%
0030.0DB=000.0%
0032.0DB=000.0%
0034.0DB=000.3%
0036.0DB=006.5%
0038.0DB=013.7%
0040.0DB=016.1%
0042.0DB=016.5%
0044.0DB=016.1%
0046.0DB=013.3%
0048.0DB=008.1%
0050.0DB=004.6%
0052.0DB=001.9%
0054.0DB=000.7%
0056.0DB=000.3%
0058.0DB=000.0%
0060.0DB=000.0%
0062.0DB=000.0%
0064.0DB=000.0%
0066.0DB=000.0%
0068.0DB=000.0%
0070.0DB=000.0%
0072.0DB=000.0%
0074.0DB=000.0%
0076.0DB=000.0%
0078.0DB=000.0%
0080.0DB=000.0%
0082.0DB=000.0%
0084.0DB=000.0%
0086.0DB=000.0%
0088.0DB=000.0%
```

Table 15. Statistical analysis at site 16 on July 20

1205-1225

```
00:12:56 S=18000
 0001=046.8DB
 0005=043.0DB
 0010=041.8DB
 0030 038.5DB
 0050=036.3DB
 0095=035.5DB
  LEQ=041.5DB
0026.0DB=000.0%
0028.0DB=000.0%
0030.0DB=000.0%
0032.0DB=000.1%
0034.0DB=009.4%
0036.0DB=032.6%
0038.0DB=034.8%
0010.0DB=014.5%
0042.0DB=001.9%
0044.0DB=001.2%
0046.0DB=000.8%
0048.0DB=000.1%
0050.0DB=000.0%
0052.0DB=000.0%
0054.0DB=000.0%
0056.0DB=000.0%
0058.0DB=000.0%
0060.0DB=000.0%
0062.0DB=000.0%
0064.0DB=000.0%
0066.0DB=000.0%
0068.0DB=000.0%
0070.0DB=000.0%
0072.0DB=000.0%
0074.0DB=000.0%
0076.0DB=000.0%
0078.0DB=000.0%
0080.0DB=000.0%
0082.0DB=000.0%
0084.0DB=000.0%
0086.0DB=000.0%
0088.0DB=000.0%
```

Table 16. Statistical analyses of seashore noise at Cap Chat

July 21
1805-1820

```
00:30:23 S=09000
 0001=061.5DB
 0005=060.5DB
 0010=060.0DB
 0050=058.3DB
 0090=056.5DB
 0095=056.0DB
  LEQ=058.3DB
0026.0DB=000.0%
0028.0DB=000.0%
0030.0DB=000.0%
0032.0DB=000.0%
0034.0DB=000.0%
0036.0DB=000.0%
0038.0DB=000.0%
0010.0DB=000.0%
0042.0DB=000.0%
0044.0DB=000.0%
0046.0DB=000.0%
0048.0DB=000.0%
0050.0DB=000.0%
0052.0DB=000.4%
0054.0DB=006.5%
0056.0DB=041.1%
0058.0DB=042.8%
0060.0DB=008.0%
0062.0DB=000.1%
0064.0DB=000.0%
0066.0DB=000.0%
0068.0DB=000.0%
0070.0DB=000.0%
0072.0DB=000.0%
0074.0DB=000.0%
0076.0DB=000.0%
0078.0DB=000.0%
0080.0DB=000.0%
0082.0DB=000.0%
0084.0DB=000.0%
0086.0DB=000.0%
0088.0DB=000.0%
```

July 22
1104-1204

```
00:12:04 S=36000
 0001=063.5DB
 0005=062.5DB
 0010=062.0DB
 0050=060.5DB
 0090=059.0DB
 0095=058.5DB
  LEQ=060.5DB
0026.0DB=000.0%
0028.0DB=000.0%
0030.0DB=000.0%
0032.0DB=000.0%
0034.0DB=000.0%
0036.0DB=000.0%
0038.0DB=000.0%
0010.0DB=000.0%
0042.0DB=000.0%
0044.0DB=000.0%
0046.0DB=000.0%
0048.0DB=000.0%
0050.0DB=000.0%
0052.0DB=000.0%
0054.0DB=000.0%
0056.0DB=001.6%
0058.0DB=030.1%
0060.0DB=052.5%
0062.0DB=008.8%
0064.0DB=000.5%
0066.0DB=000.0%
0068.0DB=000.0%
0070.0DB=000.0%
0072.0DB=000.0%
0074.0DB=000.0%
0076.0DB=000.0%
0078.0DB=000.0%
0080.0DB=000.0%
0082.0DB=000.0%
0084.0DB=000.0%
0086.0DB=000.0%
0088.0DB=000.0%
```

July 22
1208-1308

```
00:13:06 S=36000
 0001=062.5DB
 0005=061.5DB
 0010=061.0DB
 0050=059.3DB
 0090=057.8DB
 0095=057.3DB
  LEQ=059.3DB
0026.0DB=000.0%
0028.0DB=000.0%
0030.0DB=000.0%
0032.0DB=000.0%
0034.0DB=000.0%
0036.0DB=000.0%
0038.0DB=000.0%
0010.0DB=000.0%
0042.0DB=000.0%
0044.0DB=000.0%
0046.0DB=000.0%
0048.0DB=000.0%
0050.0DB=000.0%
0052.0DB 000.0%
0054.0DB 000.0%
0056.0DB 015.3%
0058.0DB-059.9%
0060.0DB-022.1%
0062.0DB=001.2%
0064.0DB=000.0%
0066.0DB=000.0%
0068.0DB=000.0%
0070.0DB-000.0%
0072.0DB 000.0%
0074.0DB-000.0%
0076.0DB-000.0%
0078.0DB-000.0%
0080.0DB 000.0%
0082.0DB 000.0%
0084.0DB 000.0%
0086.0DB 000.0%
0088.0DB 000.0%
```

Table 17. Statistical analyses of seashore noise at Cap Chat

July 22 1900-1400	July 23 0800-1000
00:11:00 S=36000	00:10:00 S=36000
L0001=061.3DB	L0001=052.8DB
L0005=060.5DB	L0005 050.5DB
L0010=060.0DB	L0010 049.5DB
L0050=058.5DB	L0050 046.5DB
L0090=056.8DB	L0090 044.5DB
L0095=056.5DB	L0095 043.8DB
LEQ=058.4DB	LEQ 047.6DB
D026.0DB=000.0%	D026 0DB 000.0%
D028.0DB=000.0%	D028 0DB 000.0%
D030.0DB=000.0%	D030 0DB 000.0%
D032.0DB=000.0%	D032 0DB 000.0%
D034.0DB=000.0%	D034 0DB 000.0%
D036.0DB=000.0%	D036 0DB 000.0%
D038.0DB=000.0%	D038 0DB 000.0%
D040.0DB=000.0%	D040 0DB 000.5%
D042.0DB=000.0%	D042 0DB 007.6%
D044.0DB=000.0%	D044 0DB 035.5%
D046.0DB=000.0%	D046 0DB 036.1%
D048.0DB=000.0%	D048 0DB 014.2%
D050.0DB=000.0%	D050 0DB 006.7%
D052.0DB=000.0%	D052 0DB 001.6%
D054.0DB=002.4%	D054 0DB 000.1%
D056.0DB=038.2%	D056 0DB 000.0%
D058.0DB=050.8%	D058 0DB 000.0%
D060.0DB=007.8%	D060 0DB 000.0%
D062.0DB=000.1%	D062 0DB 000.0%
D064.0DB=000.0%	D064 0DB 000.0%
D066.0DB=000.0%	D066 0DB 000.0%
D068.0DB=000.0%	D068 0DB 000.0%
D070.0DB=000.0%	D070 0DB 000.0%
D072.0DB=000.0%	D072 0DB 000.0%
D074.0DB=000.0%	D074 0DB 000.0%
D076.0DB=000.0%	D076 0DB 000.0%
D078.0DB=000.0%	D078 0DB 000.0%
D080.0DB=000.0%	D080 0DB 000.0%
D082.0DB=000.0%	D082 0DB 000.0%
D084.0DB=000.0%	D084 0DB 000.0%
D086.0DB=000.0%	D086 0DB 000.0%
D088.0DB=000.0%	D088 0DB 000.0%

Table 18. Grouping of sites having similar conditions

Group	Sites	Description
1	1,4	Near trees
2	2,5,6	30 m from trees and paved backroad
3	9,12	Near trees 90 m from Highway 132
4	9,14	80 m from Highway 132
5	8,11,13	25 m from Highway 132
6	3	Open field
7	15,16,19,20,21	0.75 km from Highway 132
8	7	Cap Chat neighborhood

Table 19. Usual background levels in dBA. (Occasional levels shown in brackets)

(Occasional levels shown in brackets)

Group	Description	Daytime	Nighttime	During Rain
1	Near trees	42-45 (53)	32	50
2	30 m from trees and back road	36-46 (60)	28	44
3	90 m from 132	46	38	(55) storm
4	80 m from 132	48 (60)	38	
5	25 m from 132	53-60	47	
6	Open field	40	30	43
7	0.75 km from 132	40 (52-60)	30	
8	Cap Chat neighborhood	56 (65)	41	

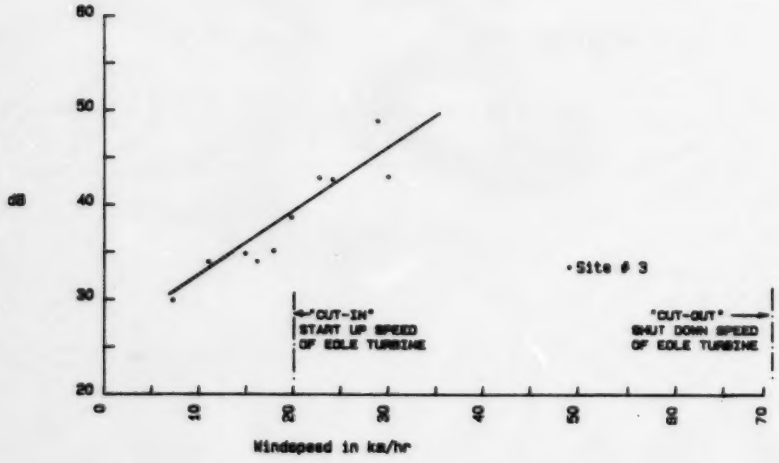

Fig. 41. Hourly L_{eq} levels in an open field

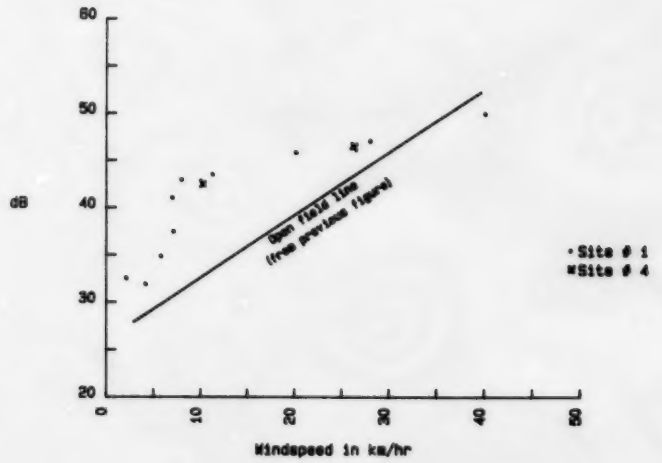

Fig. 42. Hourly L_{eq} levels near trees

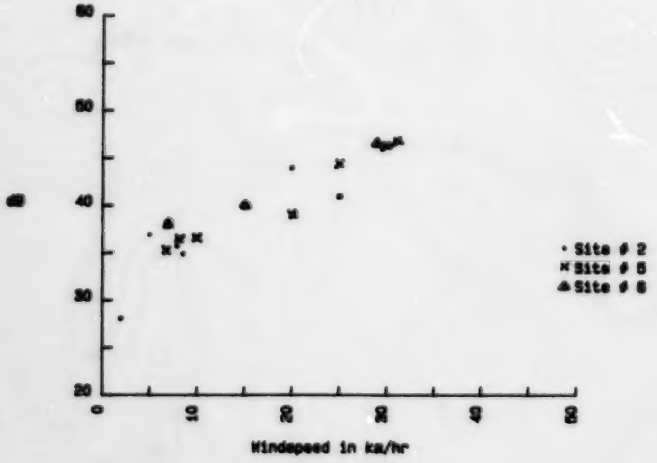

Fig. 43. Hourly L_{eq} levels 30 m from trees and paved secondary road

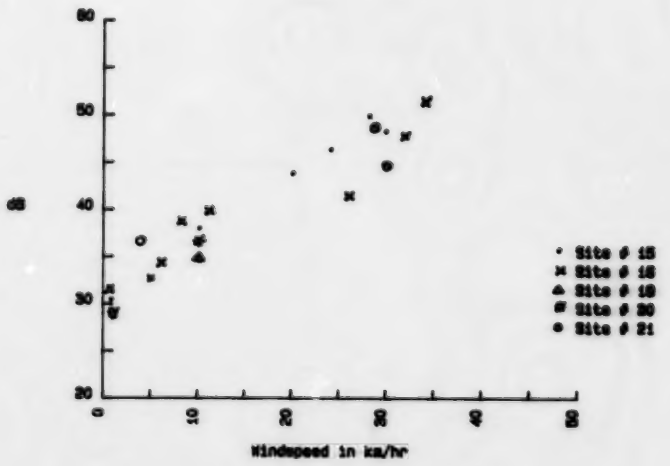

Fig. 44. Hourly L_{eq} levels .75 km from Highway 132

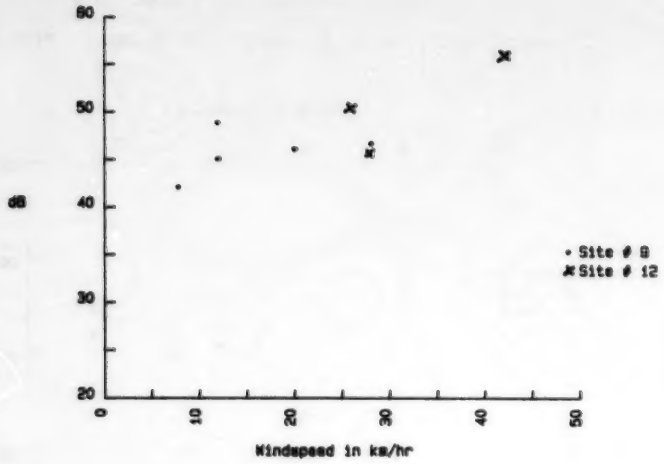

Fig. 45. Hourly L_{eq} levels near trees 90 m from Highway 132

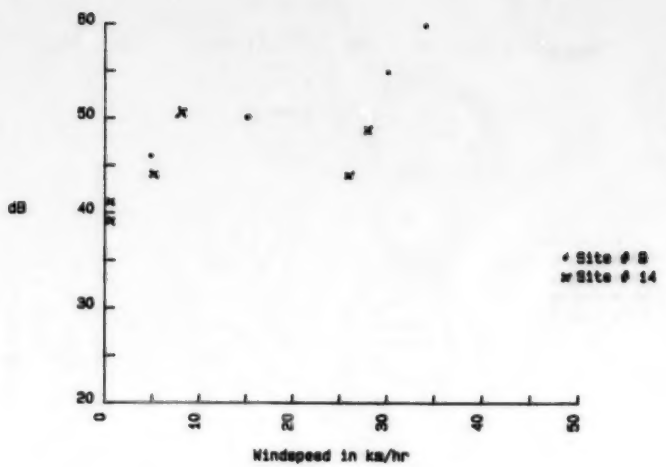

Fig. 46. Hourly L_{eq} levels 80 m from Highway 132

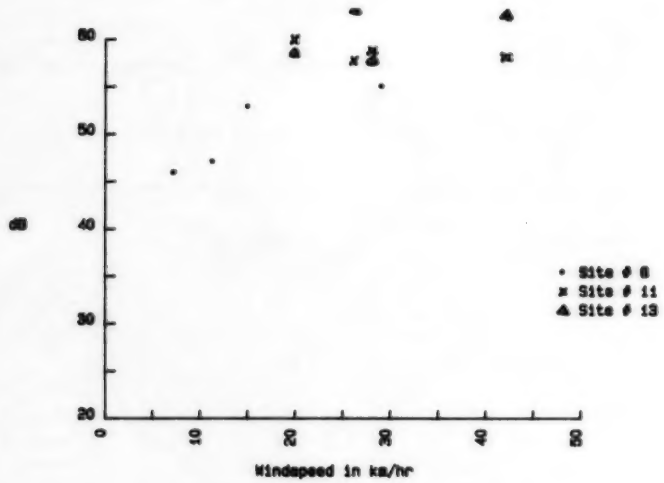

Fig. 47. Hourly L_{eq} levels 25 m from Highway 132

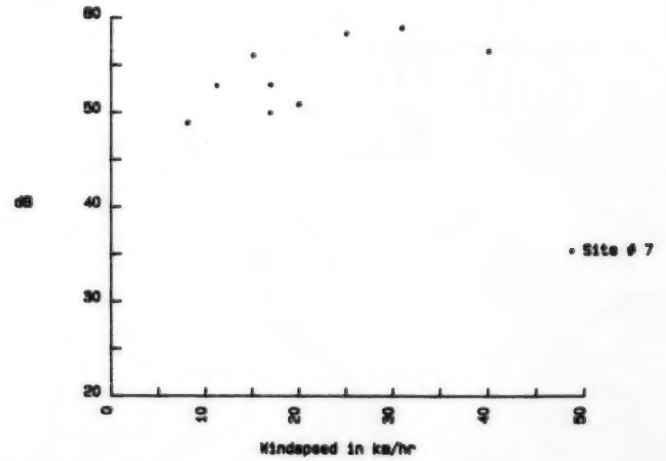

Fig. 48. Hourly L_{eq} levels in the Cap Chat neighborhood

low wind speed conditions in the range of 10-20 km/h (where the turbine will not be operating).

Figure 43 shows the variation of noise levels 30 m from trees, close to a paved secondary road where traffic was very light and hence did not contribute significantly to the hourly L_{eq} levels. In the figure, the points are scattered with 5 to 6 dB variations.

Figures 44 to 48 show the variation of L_{eq} levels with wind speed at several distances from Highway 132. At 0.75 km from the highway the noise levels increase with wind speed in Figure 44 and are not significantly affected by traffic noise. In Figure 45 the levels near the trees are much higher than the levels in an open field. The traffic noise dominates the wind noise closer to the highway as shown in Figures 45 to 47, especially at low wind speeds.

Figure 48 shows the noise levels in the Cap Chat neighborhood where most of the noise was due to neighborhood activity.

6.0 DISCUSSION

The results shown in the preceding section show that the measured background noise levels in the area surrounding Project ÉOLE vary from 30 to 60 dB during the summer. Obviously higher noise levels were evident in the residential area of Cap Chat close to Highway 132, where daytime L_{eq} levels vary from 50 to 60 dB and nightime levels are around 45 dB. Since the wind turbine will be operating at a distance greater then 0.75 km from the main residential area of Cap Chat, the noise impact from the machine is not expected to be serious in view of high background noise levels. The levels recorded at measurement sites 8, 9, 11, 12, 13, and 14, which were located near the houses along the highway, are too high to be affected by the wind turbine noise propagation.

Background noise at the sites 2, 5, and 6 near the houses along the paved road south of the turbine site were sometimes low, reaching below 30 dB during midnight hours. There is a slight possibility that the people living in these houses might be able to hear the turbine noise, especially at low wind speeds. However, the noise levels are not expected to increase drastically to the annoyance of these residents. Much will depend on the propagation conditions such as wind speed, temperature, and humidity. In the vicinity of points 4, 17, 19, and 20 where the background noise levels are low, there are no houses situated.

In rural areas, in the absence of road traffic the background noise levels are influenced by many factors which include wind, animals,

vegetation on the ground, farming activities, waves and tides in the presence of a river or sea. Tourism in the area increases background noise levels in the summer months. Several of the above-mentioned factors have been identified in the results.

In the absence of strong winds and rain, the lowest noise levels occur during midnight hours when the traffic is low and all the activities are at a standstill. In the Cap Chat neighborhood, the peak levels occur around 1800 hours during summer months, when people are returning home after the day's activity.

Wind is the most important source of background noise levels in the absence of traffic. The results presented in this report show that noise levels vary strongly with wind speed in open areas. In the presence of trees, the levels increase by 2 to 10 dB depending on wind speed. The measurements made on some of the horizontal axis wind turbines have shown that at high wind speeds the turbine noise is likely to be masked by wind noise. It is at low wind speeds that the turbine noise is likely to change the local background noise levels.

Prediction of wind noise at various wind speeds under different ground conditions (vegetations) is important to assess the noise impact in new turbine installations. The results presented in this report would be useful in developing any prediction schemes for future installations. In a recently held IEC workshop on wind turbine noise measurements there was considerable discussion on estimating background noise levels at various wind speeds under different ground conditions.

7.0 CONCLUSIONS

The existing background noise levels in the residential area of Cap Chat are too high to be seriously affected by the radiated noise from the turbine. Although the existing levels near the scattered houses to the south of the turbine site are low at low wind speeds, it is unlikely that the noise radiated from the turbine will increase these levels because of the large distance of the houses from the turbine. The existing levels near the houses along the Highway 132 are too high to be influenced by the turbine noise. The houses in this area are located in the region of high background noise levels caused by the highway traffic.

The data presented in this report indicate that the noise varies almost linearly with wind speed in the specified range. The presence of trees increases the background noise levels by 2 to 10 dB in the specified range of wind speed.